FISHERIES ECONOMICS AND MARKETING - AN INTRODUCTION

Shyam S. Salim
R. S. Biradar
S. K. Pandey

केन्द्रीय मात्स्यिकी शिक्षा संस्थान
Central Institute of Fisheries Education
(Deemed University), ICAR, Fisheries University Road,
Seven Bunglows, Versova, Mumbai - 400 061

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Dr. Shyam S. Salim
Dr. R. S. Biradar
Mr. S. K. Pandey

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About the Authors :

Dr. Shyam S. Salim, Scientist (Senior Scale), Fisheries Informatics, Technology Evaluation and Transfer Division, CIFE, Mumbai.

Dr. R.S. Biradar, Principal Scientist Head Fisheries Informatics, Technology Evaluation and Transfer, CIFE Mumbai.

Mr. S. K. Pandey, Technical Officer, Fisheries Informatics, Technology Evaluation and Transfer Division, CIFE, Mumbai.

FOREWORD

S. C. Mukherjee
Director, CIFE.

The application of fisheries economics is essential to take appropriate rational policy decisions in fisheries for optimum exploitatio, equitable distribution, efficient marketing, and evolving alternate management strategies. The present fish production of India is 6.0 m t in wihich both the marine and inland sectors have almost equal contribution. The export earnings from marine product are about Rs. 6,091 crores during 2003-2004 and the GDP contributions from fisheries sector is about 1.3 percent. The changing pattern of technologies and consequent introduction of new catching strategies by fishermen in different locations is mainly guided by economic motive which in turn, as any other industry is governed by net monetary returns.

This text book on "fisheries economics and marketing" is an introduction, not a research monograph, and as such it is set at standard appropriate for students and researchers on relevant courses in fisheries economics. Throughout this text book, the main purpose is to explain basic economics theory giving it a fisheries dimension. It is hoped that this manual will help to introduce development economics to some of the problems of developing fisheries in areas of the world where fisheries now presents great growth prospects.

Suggestions for further improvement of this text book would be welcomed and appreciated.

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Versova, Mumbai

S. C. Mukherjee
Director, CIFE.

PREFACE

In the name of God the most benevolent and merciful

Indian fisheries sector plays an important role in socioeconomic development of the country in view of its potential contribution to national income, nutritional security, employment opportunities, social objectives, and export earnings. The fisheries sector has witnessed an impressive transformation from a traditional subsistence activity to a well developed. diversified commercial enterprise with vast untapped potential.

Social sciences in general and fisheries in particular has a pivotal role to play in the fisheries development. Social sciences and in particular economics is a day-to-day business. It is practiced and prevalent in all walks of life rather unknowingly than intention. No individual business is away from its economics phenomenon operating in the concerned scenario. Fisheries sector with a lot of input-output relations, entrepreneurships, export-import activities, trade and management has got an intimate liaison with economics. These assume greater significance in the wake of liberalization process presently undergoing. It is necessary to reorient and also formulate the course of research and education in fisheries economics. This would also lead to highlighting the potential of the sector, returning in greater investments for the benefit of masses of the country.

The textbook on Fisheries Economics and Marketing –An Introduction is a sincere attempt towards achieving this goal of introducing and familiarizing the different concepts and methodology in the gamut of economics, which finds a place in the fisheries science.

We feel it a honour to keep on record the deep sense of gratitude and heartfelt thanks to our beloved Director Dr.S.C.Mukhrejee, Central Institute of Fisheries Education, Mumbai for his moral supports and encouragement.

Shyam, S. Salim
R. S. Biradar
S. K. Pandey

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CONTRIBUTION OF FISHERIES TO THE NATIONAL ECONOMY

Introduction

The food security problem in India has been alarming due to the rapid growth of population and the reduction of percapita land. The current scientific, economic, environmental and social trends are forcing farmers and policy makers to look for alternatives to fulfill the nutritional requirement for the growing population. Fish with an average of 18-21 percent protein can be the best alternative in this context. Fisheries sectors have been playing an important role in the national economy through improved food supply, employment and income. During 2002-03, fisheries sector contributed Rs.35482 crores to the total Gross Domestic product (GDP), forming 1.43 per cent of the total. The seafood exported from India in terms of volume is 4.1 lakh tonnes and Rs 6091 crores in terms of value (2003-2004). Fish farming practices hold promise for many small formers and potential significant benefits for strengthening the rural economy.

Fisheries sector plays very important role in national economy, in the following areas.

A. National Income

During 2002-03, fisheries sector contributed Rs.35482 crores to the total gross domestic product (GDP) .The gross income generated at landing center level from the marine fish catch of 2.7 million tonnes in 1999-2000 is worked out to be Rs.18,412 crores. Table 1.1 gives the details of total GDP, GDP from agriculture and fisheries.

Table 1.1: Contribution of fisheries sector to gross domestic product (current prices)

Year	Total GDP	GDP from		GDP from fisheries as per cent of	
		Agriculture	Fisheries	Total GDP	GDP from agriculture
1990-91	475,604	135,162	4,556	0.96	3.37
1991-92	551,552	162,317	5,300	0.96	3.27
1992-93	627,913	184,536	6,649	1.06	3.60
1993-94	799,077	242,438	9,074	1.14	3.74
1994-95	943,408	284,042	11,099	1.18	3.91
1995-96	1,103,238	312,791	12,729	1.15	4.07
1996-97	1,285,259	376,091	15,055	1.17	4.00
1997-98	1,384,446	387,445	19,555	1.41	5.04
1998-99	1,612,383	469,340	22,223	1.38	4.73
2002-03	2,481,262	704,678	35.482	1.43	5.04

Export earnings also contribute to national income. Seafood exported from India in terms of quantity was 4.1 lakhs tonnes and Rs.6, 091 crores in terms of value (during 2003-2004).

Export earnings increased from Rs.2.46 crores in 1950-51 to Rs 6091 crores in 2003-2004. About 85 percent of the catch is channelised to internal consumption and the rest for exports.

Table 1.2 Fish Export from India

Year	Quantity ('000 tonnes)	Value (Rs. Crores)
1950-51	19.7	2.46
1960-61	15.7	3.92
1970-71	35.9	35.07
1980-81	75.6	234.84
1990-91	139.4	893.37
1991-92	171.8	1375.89
1992-93	208.6	1767.43
1993-94	244.0	2503.62
1994-95	307.3	3775.27
1995-96	296.3	3501.11
1996-97	378.2	4121.36
1997-98	385.8	4697.48
1998-99	303.0	4626.87
1999-2000	340.0	5096.00
2000-2001	440.5	6443.89
2001-2002	424.47	5957.05
2002-2003	467.30	6881.31
2003-2004	412.02	6091.95

Major Items

In the total marine product exports, the major share had been of frozen shrimp only. The share of shrimp in marine product exports during 2003-04 in terms of value was 65.8 per cent. The reason for such high share of shrimp is its unit value of price. The unit value of frozen shrimp has been next to frozen lobsters, which has the highest value. The unit values of the shrimps,fin fish,cuttle fish and squid for 2003-04 were $6.76/kg, $0.98/kg , $2.40and $2.14/kg respectively.

Frozen Shrimp continued to be the largest item in terms of value. Shrimp contributed 31.50 per cent in volume and 65.88 per cent in value of the total export of marine products from India. Even though the share of Shrimp has increased from 28.85 per cent of the previous year to 31.50 per cent in terms of quantity, it declined from 66.97 per cent of the previous year to 65.88 per cent in terms of value. Export of Fr. Shrimp has shown a decline both in terms of quantity and value. The unit value of Shrimp also decreased to US $ 6.76 per kg from US $ 7.07 per kg i.e. down by 4.48 per cent.It recorded a decline to the tune of 3.74 per cent, 12.92 per cent and 8.06 per cent in terms of volume, rupee earnings and in US $ realisation respectively.

The share of Frozen Fish during 2003-04 was 33.50 per centin volume against 42.01 per cent in 2002-03 and 10.19 per cent in value against 12.23 per cent in 2002-03. The export of Frozen fish also showed a considerable decrease of 29.70 per cent in quantity and 26.25 per cent in rupee value compared to the previous year. However, the unit value realised increased to US $ 0.98 per kg from US $ 0.89 of the last year registering a growth of 10.63 per cent. All the Frozen Fish except Frozen Tuna (Skipjack, Yellow Fin, Big eye), Fr. Sea bream Fr. Baracuda and Fresh water fish contributed considerably for the decrease in the export of Frozen Fish.

This year, export of Cephalopods especially Squid showed a negative growth however Fr. octopus showed a positive growth whereas Cuttlefish showed a positive growth in terms of value and unit value realisation but showed a declining trend in quantity. The decline of Fr. Squid was to the tune of 0.02 per cent in terms of quantity and 2.98 per cent in value terms but showed a positive growth of 1.47 per cent in US $ terms. However, there was a marginal increase in unit value realisation. Export of Frozen Cuttlefish showed an increase of 4.34 per cent in terms of value and 9.90 per cent in terms of US $ realisation. However, it showed a negative growth of 4.28 per cent in terms of volume.

There has been considerable increase in the export of dried items with 53.75 per cent in volume, 72.96 per cent in rupee earnings and 81.50 per cent in US $ realisation. The average unit value also increased by 18.07 per cent. Dried Salted Jelly fish has shown a remarkable increase in quantity, value and unit value realisation. Dried fish fillet, Dried shark tail, Dried Nakhla, Dried fish nails, etc. also contributed for the positive growth. Export of Beche-de-mer was nil during the year due to ban.

Live items except Live Whelk (Baigai) and Live Aquarium fish showed a decrease in exports during the year. It showed an increase by 10.69 per cent in volume and 0.27 per cent in US$ realisation and a decrease of 4.77 per cent in rupee earnings. The export of chilled items showed an increase to the tune of 12.81 per cent in volume 8.29 per cent in rupee earnings, and 14.10 per cent in US $ realisation. Growth was mainly recorded in the export of Chilled items like Reef Cod, Prawn, Snapper, Pomfret, Fresh water fish etc.

Export of Surumi declined. However, there is a marginal increase in terms of quantity in respect of Crab stick, Frozen Seafood mix, Crab, Baigai meat, etc. Details of item-wise export during the last two years are furnished below:

Table 1.3: Export of Marine Products Category wise – India, 2003-04

ITEM WISE EXPORT OF MARINE PRODUCTS

Q: QUANTIY IN MT, V: IN RS. CRORE, $: US$ IN MILLION, UV$: UNIT VALUE IN US$/KG

ITEMS	per cent Share to Total		APR-MAR 2003-04	APR-MAR 2002-03	VARIATION	(per cent)
Frozen Shrimp	31.50	Q	129768	134815	-5047	-3.74
	65.88	V	4013.07	4608.31	-595.24	-12.92
	65.88	$	876.64	953.44	-76.80	-8.06
		UV$	6.76	7.07	-0.31	-4.48
Frozen Fin Fish	33.50	Q	138023	196322	-58299	-29.70
	10.19	V	620.73	841.65	-220.92	-26.25
	10.20	$	135.82	174.63	-38.81	-22.22
		UV$	0.98	0.89	0.09	10.63
Frozen Cuttle Fish	9.61	Q	39610	41381	-1771	-4.28
	7.14	V	435.18	417.09	18.09	4.34
	7.13	$	94.92	86.09	8.55	9.90
		UV$	2.40	2.09	0.31	14.80
Frozen Squid	9.18	Q	37832	37838	-6	-0.02
	6.12	V	372.92	384.37	-11.45	-2.98
	6.09	$	81.00	79.83	1.17	1.47
		UV$	2.14	2.11	0.03	1.49
Dried items	3.05	Q	12574	8178	4396	53.75
	2.39	V	145.68	84.23	61.45	72.96
	2.38	$	31.69	17.46	14.23	81.50
	UV$	2.52	2.13	0.39	18 07	
Live items	0.57	Q	2341	2115	226	10.69
	0.84	V	51.1	53.66	-2.56	-4.77
	0.84	$	11.15	11.12	0.03	0.27

		UV$	4.76	5.26	-0.50	-9.42
Chilled items	0.92	Q	3779	3350	429	12.81
	1.05	V	64.04	59.14	4.90	8.29
	1.05	$	14.00	12.27	1.73	14.10
		UV$	3.71	3.66	0.05	1.17
Others	11.67	Q	48090	43298	4792	11.07
	6.39	V	389.23	432.86	-43.63	-10.08
	6.43	$	85.54	89.78	-4.24	-4.72
		UV$	1.78	2.07	-0.29	-14.22
TOTAL	100	Q	412017	467297	-55280	-11.83
	100	V	6091.95	6881.31	-789.36	-11.47
	100	$	1330.76	1424.90	-94.14	-6.61
		UV$	3.23	3.05	0.18	5.92

(*) U V$ variation per cent is worked out on the basis of actual value and not on the rounded valueQ: Quantity; V: Value

Source: Marine Products Export Review – 2003-04

Major Markets

Though USA continued to be the single largest market for Indian marine products in value terms during 2002-03 relegating Japan to the second position for the consecutive 2nd year, the share of USA has declined to 12.90 per cent, 27.61 per cent 27.49 per cent from 13.21 per cent, 29.81 per cent,29.79 per cent in quantity, in rupee value and in US $ terms respectively. Export to USA declined by 13.86 per cent in volume, 17.99 per cent in rupee value and 13.82 per cent in US dollar realisation compared to the previous year. There was a shortfall in the export to Japan to the tune of 8.92 per cent, 24.18 per cent and 19.96 per cent in quantity, in rupee value and in US $ terms respectively. Export to EU has registered a positive growth in export compared to the previous year. The export to EU countries showed a marginal increase of 1.84 per cent, 5.94 per cent 11.16 per cent in qty, in rupee value and in US $ terms respectively when compared to the year 2002-03. The member countries of EU together accounted for 23.37 per cent, 24.15 per cent and 24.04 per cent in the total quantity, in rupee value and in US $ terms of Indian marine products exported during 2003-04. In terms of quantity, China occupied the first position contributing 30.03 per cent of the total exports from India. However, China's share in value was only 11.10 per cent in rupee value terms and 11.39 per cent in US $ terms. This was mainly due to the export of low valued items, especially Finfish varieties like Frozen Ribbonfish, Frozen Croaker, etc. There was also a significant decrease in exports to China in terms of quantity by 27.56 per cent and value by 11.28 per cent

in rupee value terms and 4.19 per cent in US $ terms while the export to South East Asia increased by 14.91 per cent in quantity but there was a decline of 15.04 per cent in rupee value and 10.53 per cent in US $ terms compared to last year. The export to Middle East market has also decreased by 25.20 per cent in quantity, 1.57 per cent in value but a marginal increase of 3.58 per cent in dollar terms. Minor markets like Canada, South Africa, Mauritius, Tunisia, Puerto Rica, Cyprus, Poland, Algeria, Ukraine, Maldives Islands, Reunion, Hungary, Fuji Island, Bangladesh, Ivory Coast, etc. showed a positive growth. The country-wise export details during the last two years are furnished below:

Table 1.4 : Export of marine products by market, 2003-04

COUNTRY WISE EXPORT OF MARINE PRODUCTS

Q:Quantity in M T, V: Value in Rs. Crore, $: US Dollar Million

Country	per cent share to Total		Apr-Mar 2003-04	Apr-Mar 2002-03	Variation	per cent
Japan	12.14	Q	50020	54916	-4896	-8.92
	19.10	V	1163.69	1534.76	-371.07	-24.18
	19.08	$	253.86	317.17	-63.31	-19.96
USA	12.90	Q	53153	61703	-8550	-13.86
	27.61	V	1682.06	2051.12	-369.06	-17.99
	27.49	$	365.84	424.51	-58.67	-13.82
European Union	23.37	Q	96284	94541	1743	1.84
	24.15	V	1470.99	1388.47	82.52	5.94
	24.04	$	319.95	287.84	32.11	11.16
China	30.03	Q	123738	170811	-47073	-27.56
	11.10	V	676.46	762.48	-86.02	-11.28
	11.39	$	151.60	158.23	-6.63	-4.19
South East Asia	12.30	Q	50670	44097	6573	14.91
	8.96	V	545.77	642.38	-96.61	-15.04
	8.95	$	119.13	133.15	-14.02	-10.53
Middle East	3.57	Q	14711	19668	-4957	-25.20
	3.31	V	201.52	204.74	-3.22	-1.57
	3.30	$	43.92	42.40	1.52	3.58
Others	5.69	Q	23441	21561	1880	8.72

	5.77	V	351.46	297.36	54.10	18.19
	5.75	$	76.76	61.60	14.86	24.12
Total	100.00	Q	412017	467297	-55280	-11.83
	100.00	V	6091.95	6881.31	-789.36	-11.47
	100.00	$	1330.76	1424.90	-94.14	-6.61

Q – Quantity in tonnes

V – Value in Rs. crores

Source: Marine Products Export Review – 2003-04

Performance of the Seaports/Airports

Chennai continued to be the largest port with a share of 24.71 per cent in rupee value, 24.59 per cent in US $ terms and 11.38 per cent in volume. There was a decline in export in terms of quantity by 11.31 per cent, in rupee value by 27.31 per cent and in US $ terms by 23.61 per cent when compared to the previous year. JNP (Mumbai) emerged as the single largest port in quantity with a share of 23.20 per cent followed by Pipavav by 21.75 per cent. The export from JNP declined by 11.47 per cent, 8.63 per cent and 3.56 per cent when compared to the previous year in volume, in rupee value and in US $ terms respectively. Though the export from Kochi port was up by 5.37 per cent in terms of rupee value and 12.35 per cent in US $ terms, there was a decline of 5.74 per cent in quantity when compared to the previous year. Kochi has the 2nd largest position among the Indian ports with a share of 17.68 per cent in value and 3rd largest port with 18.39 per cent in volume. The main reason for this downward trend in volume was the decrease in fish landings. Exports through Vizag port also declined to the tune of 5.03 per cent in terms of quantity, 13.86 per cent in rupee value and 9.17 per cent in US $ terms. The share of Pipavav marginally increased to 21.75 per cent from 21.20 per cent in volume and to 7.84 per cent from 7.67 per cent in value. Exports through Tuticorin port and Haldia have alone shown a positive growth both in terms of quantity and value. Exports through the other ports of Gujarat i.e. Kandla and Porbandar and also through ports like Kolkata, Mumbai, Goa and Mangalore and the airport of Trivandrum were reduced considerably. There was no export from Kakkinada port during 2003-04. The port-wise export details during the last two years are furnished below:

Table 1.5 : Port-wise export of marine products, 2003-04

Port wise export of marine products
Q: QUANTITY IN M T, V: IN RS. CRORE, $: US$ IN MILLION

Ports	per cent share to total		Apr- Mar 2003-04	Apr- Mar 2002-03	Variation	(per cent)
Chennai	11.38	Q	46894	52877	-5983	-11.31
	24.71	V	1505.51	2071.05	-565.54	-27.31
	24.59	$	327.30	428.47	-101.17	-23.61
Kochi	18.39	Q	75761	80373	-4612	-5.74
	17.68	V	1077.11	1022.22	54.89	5.37
	17.87	$	237.84	211.69	26.15	12.35
J N P	23.20	Q	95584	107972	-12388	-11.47
	13.74	V	837.25	916.29	-79.04	-8.63
	13.78	$	183.35	190.12	-6.77	-3.56
Vizag	5.89	Q	24284	25571	-1287	-5.03
	12.54	V	763.64	886.51	-122.87	-13.86
	12.51	$	166.47	183.27	-16.80	-9.17
Tuticorin	5.23	Q	21568	17270	4298	24.89
	9.29	V	565.65	436.82	128.83	29.49
	9.26	$	123.28	90.43	32.85	36.33
Kolkata	4.24	Q	17473	17386	87	0.50
	8.92	V	543.56	557.43	-13.87	-2.49
	8.87	$	118.03	115.29	2.74	2.38
Pipavav	21.75	Q	89628	99070	-9442	-9.53
	7.83	V	477.31	527.59	-50.28	-9.53
	7.85	$	104.41	109.67	-5.26	-4.80
Kandla	3.28	Q	13505	17650	-4145	-23.48
	1.79	V	109.24	136.14	-26.90	-19.76
	1.78	$	23.64	28.13	-4.49	-15.96
Porbandar	1.28	Q	5253	17327	-12074	-69.68
	0.46	V	27.86	96.63	-68.77	-71.17
	0.46	$	6.14	20.05	-13.92	-69.39
Mumbai	0.45	Q	1873	4805	-2432	-56.49
	0.78	V	47.37	67.97	-20.60	-30.31
	0.78	$	10.33	14.09	-3.76	-26.69
Mangalore/Icd	2.06	Q	8474	9996	-1522	-15.23
	1.06	V	64.48	64.76	-0.28	-0.43
	1.05	$	13.99	13.44	0.55	4.09

Goa	2.48	Q	10212	15395	-5183	-33.67
	0.52	V	31.4	50.11	-18.71	-37.34
	0.52	$	6.89	10.37	-3.48	-33.56
Trivandrum	0.21	Q	866	1020	-154	-15.10
	0.36	V	22.02	23.60	-1.58	-6.69
	0.36	$	4.81	4.89	-0.08	-1.64
Kakinada	0.00	Q	0	228	-228	-100
	0.00	V	0	9.68	-9.68	-100
	0.00	$	0	1.98	-1.98	-100
Paradeep	0.03	Q	110	624	-514	-82.37
	0.02	V	1.09	9.28	-8.19	-88.25
	0.02	$	0.24	1.92	-1.68	-87.50
Haldia	0.13	Q	528	233	295	126.61
	0.30	V	18.44	5.23	13.21	252.58
	0.30	$	4.04	1.08	2.96	274.07
Calicut	0.00	Q	4	0	4	****
	0.00	V	0.02	0	0.02	****
	0.00	$	0	0	0.00	****
Total	100	Q	412017	467297	-55280	-11.83
	100	V	6091.95	6881.31	-789.36	-11.47
	100	$	1330.76	1424.90	-94.14	-6.61

Source: Marine Products Export Review – 2003-04

B. Fish For Food Security/Nutritional Security

Malnutrition is worldwide problem, for which the development of under-exploited and unexploited fisheries resources offers a promising solution. For a given outlay of funds, more animal protein of high quality can be obtained from fish than any other type of non-vegetarian food.

According to Dr.Anthony Measham -"Despite improvements in health and well being, while mortality has declined by half and fertility by two-fifths, malnutrition has come down by about one-fifth in the last 40 years. The inescapable conclusion is that further progress in human development in India will be difficult to achieve unless malnutrition is tackled with greater vigor and more rapid improvement in the future than in the past ". Malnutrition remains a silent emergency in India, where more than half of all children under the age group of four are malnutritioned 30 percent of newborns are significantly underweight, and 60 percent of women are anaemic. According to a new Word Bank report, malnutrition costs India at least 10 billion dollars annually in terms of lost productivity, illness and death and is seriously retarding improvements in human development and further reduction of childhood mortality. Staple crops rice and wheat are major source of energy and total protein in most diets in Asia. Fish are also a staple in many countries and additionally

have special nutritional characteristics to be considered in food security. Fish contain high amounts of protein with balanced amino acids and are rich in vitamins and minerals. They also contain polyunsaturated fatty acids, which are required in the development of the brain, and provide energy-dense fats for infants who may be unable to derive energy from predominantly cereal-based diet.

Seafood contains many important nutrients, which are readily available in dietary form. It is high in available, complete protein, low in fat and low in calories, as compared to beef and pork. Seafood is high in minerals such as iron; it is low in sodium and high in potassium and therefore excellent to include in the diets of heart patients.

Another factor that adds to food security is the growth of the fisheries sector. It is assumed that fisheries sector growth is about 6-7 per cent each year while that of agricultural sector is between 2-3 per cent.

C. Employment Generation

Besides providing direct employment, the industry is also an important income generator as it supports canneries and processing establishments, gear and equipment Manufacturers, boat yards; refrigeration and ice making plants and transport services in addition to those working in state fisheries department, fisheries corporation and other government based fisheries institutions.

Primary sector:

Full time fisherfolk	:	2.40 million
Part time	:	1.45 million
Occasional	:	2.11 million
Total	:	5.96 million
Secondary sector	:	2 million

In marine fishery sector, about 10 lakh fishermen are employed in active fishing. The pre and post harvest sectors provide employment for another 12-lakh fisherfolk, including 5 lakh women.

D. Fishery Resources

Marine Fishery Resources

Approximate length of coastline	:	8143Kms
Exclusive Economic Zone	:	2.02 Million Ks
Continental shelf Area	:	0.53 Million Sq. km

Table 1.6 Marine Fishery Resources-Coastal States And Union Territories

State/Union Territory	Approximate length of coast line (Kms.)	Continental shelf area ('000 sq.km.)
1. Andhra Pradesh	974	33
2. Goa	104	10
3. Gujarat	1,600	184
4. Karnataka	300	27
5. Kerala (p)	590	40
6. Maharashtra	720	112
7. Orissa	480	26
8. Tamil Nadu	1,076	41
9. West Bengal	158	17
10. Andaman&Nicobar Islands (p)	1,912	35
11. Daman and Diu (p)	27	-
12. Lakshadweep (p)	132	4
13. Pondicherry	45	1
Total	8,118	530

P-Provisional

Source: Handbook of Fisheries Statistics 2000

Inland Fishery Resources

- Length of Rivers and Canals : 191,024 Kms.
- Area of Reservoirs : 20.31 lakh ha
- Area of Ponds and Tanks : 23.81 lakh ha
- Area of Beels, Oxbow lakes and Derelict water bodies : 7.98 lakh ha
- Area of Brackish water : 14.37 lakhs ha

Table 1.7 Inland fishery resources by States and Union Territories

	State/Union Territory	Length of Rivers and Canals (Kms.)	Reservoirs (lakh ha)	Ponds and Tanks (lakh ha)	Beels, Oxbow lakes & Derelict water bodies (lakh ha)	Brackish water (lakh ha)
1.	Andhra Pradesh	11,514	2.24	5.17	-	0.79
2.	Arunachal Pradesh	2,000	-	2.76	0.42	-
3.	Assam	4,820	0.02	0.23	1.10	-
4.	Bihar	3,200	0.60	0.95	0.05	-
5.	Goa	250	0.03	0.03	-	-
6.	Gujarat	3,865	2.43	0.71	0.12	3.76
7.	Haryana	5,000	Neg.	0.10	0.10	-
8.	Himachal Pradesh	3,000	0.42	0.01	-	-
9.	Jammu & Kashmir	27,781	0.07	0.17	0.06	-
10.	Karnataka	9,000	2.11	2.90	-	0.80
11.	Kerala	3,092	0.30	0.30	2.43	2.43
12.	Madhya Pradesh	20,661	2.94	1.19	-	-
13.	Maharashtra	16,000	2.79	0.59	-	0.10
14.	Manipur	3,360	0.01	0.05	0.04	-
15.	Meghalaya	5,600	0.08	0.02	Neg.	-
16.	Mizoram	1,395	-	0.02		-
17.	Nagaland	1,600	0.17	0.50	Neg.	-
18.	Orissa	4,500	2.56	1.14	1.80	4.17
19.	Punjab	15,270	Neg.	0.07	-	-
20.	Rajasthan	5,290	-	1.80	-	-
21.	Sikkim	900	1.20	-	0.03	-
22.	Tamil Nadu	7,420	0.52	0.56	0.07	0.56
23.	Tripura	1,200	0.05	0.13	-	-
24.	Uttar Pradesh	31,200	1.50	1.62	1.33	-
25.	West Bengal	2,526	0.17	2.76	0.42	2.10
26.	Andaman & Nicobar Islands	115	0.01	0.03	-	0.37
27.	Chadigarh	2	-	Neg.	Neg.	-
28.	Dadra & Nagar Haveli	54	0.05	-	-	-
29.	Daman & Diu	12	-	Neg.	-	Neg.
30.	Delhi	150	0.04	-	-	-
31.	Lakshadweep	-	-	-	-	-
32.	Pondicherry	247	-	Neg.	0.01	0.01
	INDIA	191,024	20.31	23.81	7.98	14 37

Table 1.8 Length of Major Rivers of India.

Sr. No.	River	Total length(Km)	State	Length(Km)
1	Ganga	2,525	a) Uttar Pradesh	1,450
			b) Bihar	445
			c) West Bengal	520
			d) Boundary of Bihar and U.P	110
2	Brahmaputra	916	a) Arunachal Pradesh	218
			b) Assam	698
3	Indus	1,114	a) Jammu & Kashmir	1,114
4	Brahmani	799	a) Orissa	541
			b) Bihar	258
5	Krishna	1,401	a) Maharashtra	640
			b) Andhra Pradesh	386
			c) Karnataka	375
6	Mahanadi	851	a) Madhya Pradesh	357
			b) Orissa	494
7	Sabarmati	371	a) Rajasthan	48
			b) Gujarat	323
8	Narmada	1,312	a) Madhya Pradesh	1,079
			b) Gujarat	159
			c) Boundary of M.P and Gujarat	39
			d) Boundary of M.P and Maharashtra	35
9	Mahi	583	a) Madhya Pradesh	167
			b) Rajasthan	174
			c) Gujarat	242
10	Tapi	724	a) Madhya Pradesh	228
			b) Maharashtra	228
			c) Gujarat	214
			d) Boundary of M.P and Maharashtra	54
11	Godavari	1,465	a) Andhra Pradesh	771
			b) Maharashtra	694
12	Pennar	597	a) Karnataka	61
			b) Andhra Pradesh	536
13	Cauveri	800	a) Karnataka	320
			b) Tamil Nadu	416
			c) Boundary of Karnataka and Tamil Nadu	64
14	Subarnarekha	395	a) Bihar	269
			b) West Bengal	64
			c) Orissa	62

Table1.8 gives the details of length of major rivers of India and length of each river in respective states. Uttar Pradesh has the maximum length of the River (Ganga) followed by Jammu & Kashmir (Indus).

E. Production And Potential

The fish production and landings go for both domestic consumption and export. Though India is endowed with vast water resources and a good production potential, the current production (yield) is less.

Table 1.9 Fish Production and Potential (million tonnes)

Sl no		Marine	Inland	Total
1	Fish Production 2003-04	2.94	3.46	6.4
	Fish Production 2002-03	3.00	3.20	6.2
2	Production Potential (Estimated.)	3.90	4.5	8.4

Table 1.10 : Fish Production by States /Union Territories, 2002-04(000 tonnes)

Sl. No.	State/Union Territory	2002-03	2003-04
1.	Andhra Pradesh	827.90	944.64
2.	Arunachal Pradesh	2.60	2.65
3.	Assam	165.52	181.00
4.	Bihar	261.00	266.49
5.	Goa	76.53	87.36
6.	Gujarat	777.91	654.62
7.	Haryana	35.18	39.13
8.	Himachal Pradesh	7.24	6.53
9.	Jammu and Kashmir	19.75	19.75
10.	Karnataka	266.42	257.00
11.	Kerala	678.32	684.70
12.	Madhya Pradesh	42.17	50.82
13.	Maharashtra	514.10	545.13
14.	Manipur	16.60	17.60
15.	Meghalaya	5.37	5.15
16.	Mizoram	3.25	3.38
17.	Nagaland	5.50	5.56
18.	Orissa	287.53	306.90
19.	Punjab	66.00	83.65
20.	Rajasthan	25.60	14.30
21.	Sikkim	0.14	0.14
22.	Tamil Nadu	473.50	474.14
23.	Tripura	29.52	17.98
24.	Uttar Pradesh	249.84	267.00
25.	West Bengal	1120.00	1169.60
26.	Andaman and Nicobar Islands	28.30	31.15
27.	Chandigarh	0.08	0.08

28.	Dadra and Nagar Haveli	0.05	0.05
29.	Daman and Diu	11.26	13.77
30.	Delhi	2.25	2.17
31.	Lakshadweep	7.50	10.03
32.	Pondicherry	45.02	48.00
33.	Chattisgarh	99.80	111.05
34.	Uttaranchal	2.55	2.56
35	Jharkhand	45.38	75.38
36	Deep Sea Fishing	0.00	0.00
	INDIA	6199.68	6389.39

Note: Data for 2003-04 provisional
Source: 2000

Table 1.10 shows the fish production by states/union territories, for 2002-03 and –2003-04. West Bengal stands first in the total fish production during both the years.

a) Marine Fisheries Sector

Table 1.11: Potential resource available, level of exploitation and the potential available for exploitation depth wise within the Indian EEZ. (Million tonnes)

Depth Range (m)	0-50	50-200	200-500	Oceanic	Total
Demersal	1.28	1.625	0.028	-	1.933
Neretic pelagic	1.00	0.742	-	-	1.742
Oceanic pelagic	-	-	-	0.246	0.246
Total	2.28	1.367	0.028	0.246	3.921
Percent total	58.10	34.9	0.7	6.3	100.00
Percent level of exploitation*	2.08	0.63	Negligible	Negligible	2.71
Available for exploitation	0.20	0.737	0.028	0.246	1.211

*1995-96

Table1.11 shows that the fishery resource between 0-50 m depth ranges is almost fully exploited and there is scope for further exploitation only in the depth range beyond 50 m.

Table 1.12 gives the details of marine fish production by states/union territories, 2002-03 and 2003-04

Table1.12: Marine fish production by states/union territories 2002-2004(000 tonnes)

Sl. No.	State/Union Territory	2002-03	2003-04
1	Andhra Pradesh	248.50	263.93
2	Goa	72.29	83.76
3	Gujarat	743.64	609.14
4	Karnataka	180.16	187.00
5	Kerala	603.29	608.52
6	Maharashtra	386.86	420.01
7	Orissa	115.01	116.88
8	Tamil Nadu	371.50	373.00
9	West Bengal	181.50	181.60
10	Andaman & Nicobar Islands	28.23	31.06
11	Daman & Diu	11.26	13.77
12	Lakshadweep	7.50	10.03
13	Pondicherry	40.11	42.80
14.50	Deep sea fishing sector	0.00	0.00
	India	2989.85	2941.50

Source:

Table 1.12 gives the details of marine fish production by states/union territories, 2002-2004.The above table shows that Gujarat stands first in the marine fish production

Table 1.13: Marine fish landings by species – coastal states and Union territories, 1998 (provisional)

Sl. No.	Species	Landings
1.	*Hilsa ilisha*	5,137
2.	Flat Fish	23,928
3.	*Bregmaceros*	1,147
4.	*Harpodon nehereus*	179,773
5.	Sea Catfishes	71,794
6.	Lizard Fishes	13,829

7.	*Muraenesox* spp.	10,739
8.	*Lactarius*	9,591
9.	Leiognathus	53,376
10.	Sciaenidae	271,544
11.	Upeneus spp.	15,434
12.	*Lates sp., Lutjanus spp.*	80,380
13.	*Hemirhamphus* spp.	4,470
14.	Exocoetus	653
15.	*Sphyraena* spp.	13,163
16.	Mugilidae	15,553
17.	Polynemidae	6,883
18.	Caranx spp.	65,375
19.	*Trachinotus* sp.	2,342
20.	Acaridae	24,712
21.	Stromatidae	34,517
22.	*Sardinella* spp.	223,849
23.	Engraulidae	76,196
24.	Other clupeids	89,257
25.	*Chirocentrus* spp.	16,122
26.	Wahoo	-
27.	Spanish Mackerels	3,561
28.	King Mackerel	3,050
29.	Struooed Seerfish	11,532
30.	*Scomberomorus* spp.	29,723
31.	Auxis thazard, Frigate and Bullet Tuna	4,450
32.	*Euthynnus affinis*	6,174
33.	*Katsuwonus pelamis*	9,066
34.	*Thunnus tonggol*	4,741
35.	Istiophoridae	80
36.	Scombridae	38,263
37.	Trichiuridae	44,080

38.	*Rastrelliger kanagurta*	185,710
39.	Elasmobranchs	123,946
40.	Other Marine fish	153848
41.	Decapods	
	a) Penaeid prawn	158,373
	b) Non Penaeid prawn	107,108
	c) Other Crust Crab	2,375
42.	Natanian Decapods	15,233
43.	Marine Crust Crab	26,163
44.	Cephalopods	
	a) Squid and Cuttle Fish	94,358
	b) Other Molluscs	2,718
45.	Other	230,844
46.	Deep Sea Sector[@]	30,000
	Total	2,641,478

In the marine culture sector, shrimp culture is most important, as it is one of the main items in the marine product export. The following table shows the production of cultured shrimp during different years.

Table 1.14 : Production of cultured shrimp during 1994-95 to 1998-99

Year	Quantity (tonnes)	Value (Rs. million)
1994-1995	82,800	18,600
1995-1996	70,500	15,300
1996-1997	70,600	16,400
1997-1998	66,800	20,800
1998-1999	82,000	24,900
2001-02	102940	-
2002-03	30450	-

b) Inland fisheries sector

The inland resources have not been tapped to their potential. Only about 16 percent of the freshwater area and 10 percent of the brackish water area has been utilised for fish culture. The productivity, however, is low. Average productivity of freshwater aquaculture in 2003-04 was about 2.2 tonnes/ha, while there is a potential to raise yield up to 10 tonnes per ha.

Table1.15. Inland fish production by States/Union territories, 2002-04.

(In '000 tonnes)

Sl. No.	State/Union Territory	2002-03	2003-04
1.	Andhra Pradesh	579.40	680.71
2.	Arunachal Pradesh	2.60	2.65
3.	Assam	165.52	181.00
4.	Bihar	261.00	266.49
5.	Goa	4.25	3.60
6.	Gujarat	34.27	45.48
7.	Haryana	35.18	39.13
8.	Himachal Pradesh	7.24	6.53
9.	Jammu and Kashmir	19.75	19.75
10.	Karnataka	86.26	70.00
11.	Kerala	75.04	76.18
12.	Madhya Pradesh	42.17	50.82
13.	Maharashtra	127.24	125.12
14.	Manipur	16.60	17.60
15.	Meghalaya	5.37	5.15
16.	Mizoram	3.25	3.38
17.	Nagaland	5.50	5.56
18.	Orissa	172.53	190.02
19.	Punjab	66.00	83.65
20.	Rajasthan	25.60	14.30
21.	Sikkim	0.14	0.14
22.	Tamil Nadu	102.00	101.14
23.	Tripura	29.52	17.98
24.	Uttar Pradesh	249.84	267.00
25.	West Bengal	938.50	988.00
26.	Andaman and Nicobar Islands	0.07	0.09
27.	Chandigarh	0.08	0.08
28.	Dadra and Nagar Haveli	0.05	0.05

29.	Daman and Diu	0.00	0.00
30.	Delhi	2.25	2.10
31.	Lakshadweep	0.00	0.0
32.	Pondicherry	4.91	5.20
33.	Chattisgarh	99.80	11.05
34.	Uttaranchal	2.55	2.56
35.	Jharkhand	45.38	75.38
	INDIA	3209.86	3457.89

Source: Handbook of fisheries statistics – 2000

The above table shows that West Bengal stands first in inland fish production during both the year.

Table 1.16 gives the details of inland fish landings by species

Table 1.16 : Inland fish landings by species 1998 (provisional)

Sl. No.	Species	Landings
1	Major carps (Catla, rohu, mrigal and calbasu)	1,511,578
2	Minor carps	138,999
3	Exotic carps (common, silver & grass carp)	226,080
4	Murrels (*Ophiocephalus sp.*)	109,686
5	Catfishes (*Wallago attu* ,*Pangasius, Bagarius* sp.)	97,380
6	Other freshwater fishes	356,289
7	Others	160,214
	Total	2,600,226

Source: Handbook of fisheries statistics – 2000

The Table 1.17 shows the trend in fish seed production over the years

Table 1.17 : Fish seed production – India

	Year	Production (million fry)
	1973-74 (End of IVth Plan)	409
	1978-79 (End of Vth Plan)	912
	1984-85 (End of VIth Plan)	9,639
VIIth Plan		
	1985-86	6,322

	1986-87	7,601
	1987-88	8,608
	1988-89	9,325
	1989-90	9,691
Annual Plan		
	1990-91	10,332
	1991-92	12,203
VIIIth Plan		
	1992-93	12,500
	1993-94	14,239
	1994-95	14,544
	1995-96	15,007
	1996-97	15,852
IXth Plan		
	1997-98	15,904
	1998-99	15,156

Source: Handbook of Fisheries Statistics – 2000

Table 1.18 gives the details of fish seed production by states/union territories for 1998-99. West Bengal ranks first followed by Assam.

Table 1.18: Fish seed production by States/Union territories, 1998-99.

Sl. No.	State/Union Territory	1998-99
1.	Andhra Pradesh	752.40
2.	Arunachal Pradesh	24.50
3.	Assam	1,703.06
4.	Bihar	451.39
5.	Goa	0.45
6.	Gujarat	469.50
7.	Haryana	168.00
8.	Himachal Pradesh	23.21

9.	Jammu and Kashmir	10.65
10.	Karnataka	42.47
11.	Kerala	9.50
12.	Madhya Pradesh	495.10
13.	Maharashtra	241.00
14.	Manipur	98.20
15.	Meghalaya	0.78
16.	Mizoram	5.80
17.	Nagaland	50.00
18.	Orissa	261.71
19.	Punjab	71.97
20.	Rajasthan	167.31
21.	Sikkim	3.60
22.	Tamil Nadu	542.44
23.	Tripura	211.12
24.	Uttar Pradesh	730.54
25.	West Bengal	8,610.00
26.	Andaman and Nicobar Islands	0.14
27.	Chandigarh	6.60
28.	Dadra and Nagar Haveli	-
29.	Daman and Diu	-
30.	Delhi	4.25
31.	Lakshadweep	-
32.	Pondicherry	-
	INDIA	15,155.69

Source: Handbook of Fisheries Statistics – 2000

F. Infrastructure

In fishing industry with ports and associated services scattered around the coast can play an important part in maintaining some degree of balance in the distribution of population between urban and non-urban areas. Similarly the development of new ports can facilitate investment in infrastructure like roads, cold storage and ice plants etc. so essential to the general development of the remote areas.

The economic capital of marine fisheries sector includes the following.

Infrastructure	Total Number
Marine fishing villages	3638
Traditional fish landing centers	2251
Modern fish landing centers	109
Fishing harbours (1999)	
Minor fishing harbours	130
Major fishing harbours	6
Fishing crafts (1999)	
Traditional crafts	1,81,284
Motorized traditional craft	44,578
Mechanized boats	53,684
Total crafts	280,491

(The total includes 810 FRP catamarans and 135 Beach landing crafts)
Source: Handbook of Fisheries Statistics 2000

Infrastructure connected with marine product export (as registered with MPEDA 1996) includes the following.

Infrastructure	Total Number
Exporters	625 (380 manufacturer exporters and 240 merchant Exporters)
Freezing plants	376
Canning plants	13
Ice plants	149
Fishmeal plants	15
Shrimp peeling plants	903
Cold storage unit	451
Chitosan /Chitin plant	3

G. Investment

To get contribution/profit from fisheries sector, the capital that is invested should be utilised to the maximum extent; for this proper planning, allocation and management are necessary.

The table 1.19 shows that the Budget that is allocated (in fisheries) in different plans has remained under utilised.

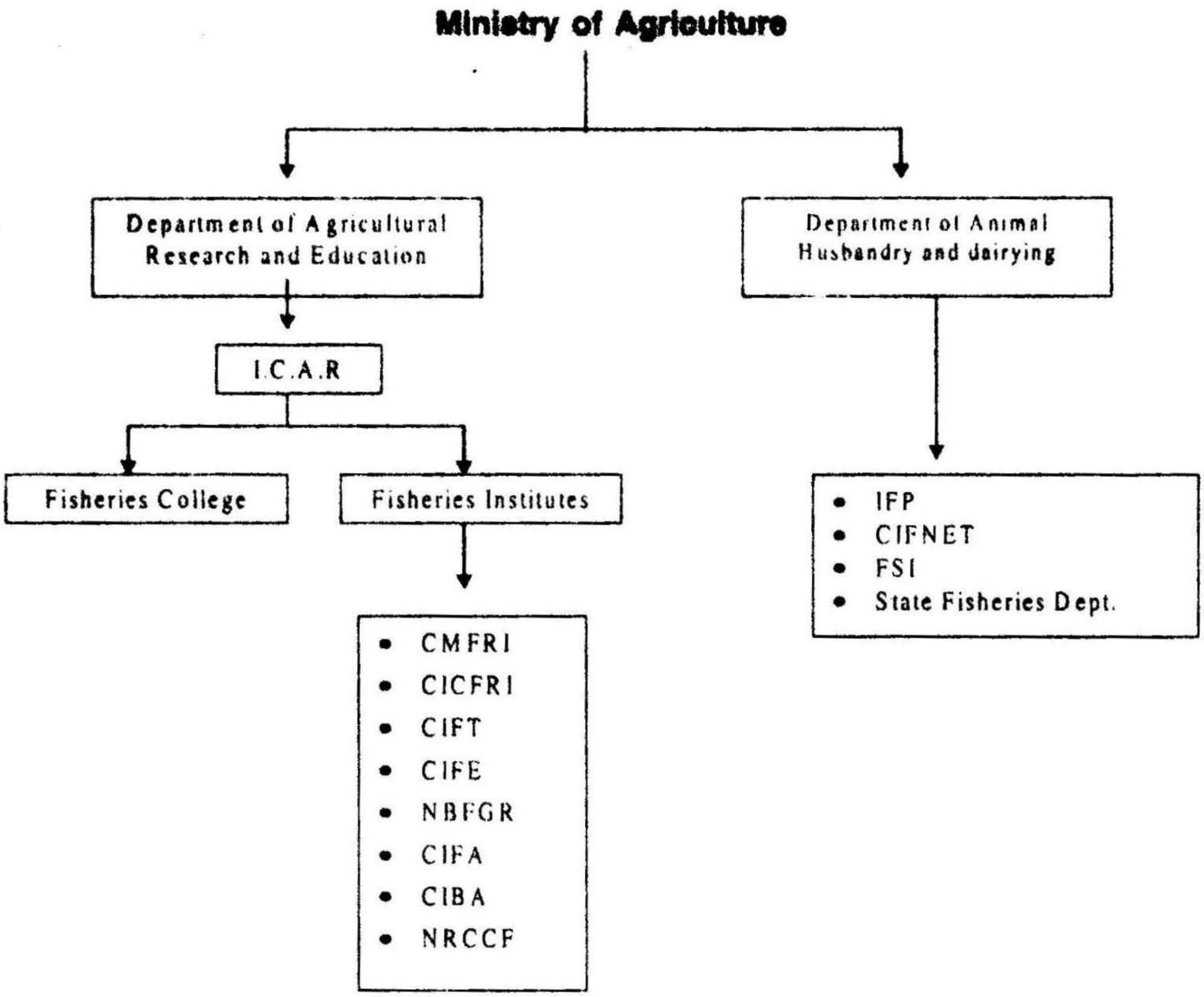
Table 1.19 Outlays and Expenditure for Fisheries Development Over plans

(Rs. Crores)

Plan	Total outlay	Total Expenditure	per cent of utilization
First plan	5.13	2.78	54.2
Second plan	12.26	9.06	73.9
Third plan	28.27	23.32	82.7
Annual plan (1966-69)	42.21	32.67	77.4
Fourth plan	82.68	54.11	65.4
Fifth plan	151.24	115.21	76.1
Sixth plan	371.14	286.95	77.3
Seventh plan	546.52	477.59	87.3
Annual plans (1990-92)	292.74	272.11	92.9
Eight plan	1205.39	1118.46	92.17
Ninth plan	2069.78	1985.35	95.92

H. Human Resource Development

Under the Ministry of Agriculture, there are many educational, training and research institutes that contribute to the Human Resource Development in fisheries sector. The divisions under the ministry of agriculture are as follows.



There are few more institutes that contribute to HRD in fisheries under the Union Ministry of Commerce and Union Ministry of Food Processing Industries. They are MPEDA, Cochin (1972) and EIA, New Delhi (1963) under the Union Ministry of Commerce and FSI, Mumbai under the Union Ministry of Food Processing Industries.

The ICAR is an apex national organisation for conducting and co-ordinating research and education and training in agriculture, animal husbandry and fisheries.

Fisheries Research and Education under ICAR is supported by the following

- 1 National Institute (Deemed University)
- 5 Resources Specific Research Institute
- 1 National Research Center
- 1 National Bureau
- 12 Fisheries Colleges

Fisheries Research under five major programmes is covered by the following eight-plan scheme.

	Programmes	Schemes
1.	Capture Fisheries	CMFRI
		CICFRI
2.	Culture Fisheries	CIFA
		CIBA
		NRCCF
3.	Harvest and Post Harvest Technology	CIFT
4.	Fish Genetic Resources	NBFGR
5.	Fisheries Education	CIFE

I. General Development

Fish, as a natural resource is an asset to our country. It has been intermingling in the history, culture, trade and development, literature, etc. of our country. Its rich biodiversity add to Nation's wealth of natural resources and therefore should be preserved for posterity. The living and non-living resources available in the EEZ offer wide scope for commercial exploitation and economic development.

CHAPTER II

INTRODUCTION TO ECONOMICS AND FISHERIES ECONOMICS

Introduction

Economics or political economy, as it was called before 1890, formed part of other disciplines like logic, psychology, politics, ethics etc. This was so since the time of Aristotle. The famous Greek philosopher, who is regarded by some writers as the first analytical economist. In his book politics, Aristotle dealt with the problem of definition and scope of economics. He defined economy proper (Oeconomicus) as the science household management. Kautilya, the great Indian statesman, named his book on statecraft as Arthashastra, the Hindi equivalent of "Economics".

In the hands of Adam Smith and his followers the classical economists- economics became a science of wealth. Adam Smith, Universally regarded as the father of economics, defined it as a science, which studies the nature and causes of national wealth. He published a book in 1976 "The Wealth of Nations".

The classical 'wealth' definition of the subject matter and scope of economics came in for bitter criticism from 2 important sources the German Historical School and the English classical economists. The English classical economists believed that individual self-interest was a ruling motive in society. On the other hand, the German historical school of economists believed that individual wants were subordinate to social and national ends.

A critic of classical economics, a French economist Sismondi, stated that it overemphasized the acquisitions of material wealth and ignored human happiness.

So 'Alfred Marshall' made changes in the traditional economic theory. He considered economics as a means an instrument to better the conditions of life. He 'humanized' the 'dismal' science. So for Marshall, economics was "on the one side, a study of wealth; on the other side, a part of the study of man; economics is a study of mankind in the ordinary business of life". The first criticism directed against Marshallian concept of treating economics or a social science rather than as a human science.

'Robbins' stated that the fundamental laws of economics apply to all persons irrespective of whether or not they are living as organized communities. According to him "an economic problem will arise wherever and whenever scarce means such as time and

money are involved in the satisfaction of certain ends". Such a problem will arise even in the care of a 'Sadhu' who may not perform any economic activity in the Marshallian sense.

Robbins introduced "scarcity" definition of economics. According to Robbins, human life exhibits the following four fundamental characteristics:

a) Man has various ends or wants to serve.

b) His means of satisfying them – time and money at his disposal are limited.

c) These limited means are capable of being put to alternative uses.

d) Consequently man has to exercise choice in distributing these limited resources between the competing ends on the basis of their relative importance.

Thus the determining influence in economics is the fact of scarcity. Scarcity of resources relative to the uses, which these resources could be, put give rise to the problem of resource allocation, which is reflected, in human behavior in the form of choice.

The utilization of natural resource endowments is by tradition a central field of enquiry in economic science. The scarcity of natural resources, land in particular, was the main concern of the classical English economists, Sir. Thomas Malthus and David Ricardo. The fact that there is a physically limited stock of mineral deposits and land at our disposal would seem to imply gloomy prospects for the future. So scarcity definition applies to these physically depletable natural resources.

In terms of source scarcity a new dimension is added when a resource is physically augmentable through a natural process. This is also get depleted if the growth rate of stock and exploitation will not match. The new dimension of scarcity arises from the interrelation between stock and growth. This is the scarcity concept most relevant for fish resources.

Fisheries economic definition

"Fisheries economics is the study of optimal allocation of resource to a fishery in such a way that the value of production and society's welfare are maximized."

Aquaculture economics

"Aquaculture production economics is an applied field of science, wherein, the principals of choice are applied to the use of capital, labour, land, and management in the aquaculture farming industry."

The goals of production economics is two fold

a) To provide guidance to individual farmers in using their resources

b) To facilitate the most efficient use of resources from the stand point of the consuming economy

Maximisation of the product (profits), minimisation cost and optimization of resources are certainly the true goals at the farmers level.

Basic production problems in aquacultural production economics:

A. What to produce?	The problem is with the product i.e. selection of enterprise
B. How to produce?	The problem is a factor-factor price. Least cost combination of production
C. How much to produce?	The problem is factor product i.e. product mix
D. When to buy and sell?	The seasonality of supply condition in factor market and product market results in variation in the prices
E. Where to buy and sell?	The problem like the producer confronts whether to sell in the village market, or in regular market or other alternative market. The producer must decide whether to involve the transportation and other charges.

The scope of aquaculture production economics is that from the studies and analysis of farm as an individual production unit we can indicate the profitable course that are to be taken by the producers. The scope includes

- Provides information which is useful in his decisions regarding the resource use.
- Predict the consequences of changes in the economic system, on the individual firms and in turn on the aggregate production on the economy.

Subject Matter

As a study of resource efficiency the subject matter includes the defining of conditions, under which the ends or objectives of farm mangers, farm families and the nations consumers can be attained at the greatest degree. Also it is concerned with productivity i.e. use of income from production resources which deals with resource use, resource allocation, resource combination, resource management, resource administration and resource administration.

The objectives of aquacultural production economics include

- To determine and outline the conditions which give the optimum use of land, labour, capital and organistaion in the farming system
- To determine the extent to which the existing use of resource deviates from the optimal use.
- To analyse the forces, which condition production pattern and resource use.
- To explain means and methods in getting the optimum use of resources from the existing one.

Different types of economics

There are mainly three different types of economics studies

a) Positive and Normative Science

b) Deduction and Induction method

c) Microeconomics and Macroeconomics

a) Positive and Normative Science

Professor Robbins divided economics as a positive and a normative science.

A positive science is concerned with 'what is' and explain 'why' and 'where for' of things, i.e., their causes and efforts.

A normative science concerned with 'what ought to be' discusses the rightness or wrongness of things.

Positive statements like what is or what happened, or how certain conditions are

related to each other, for example six percent of the work force was unemployed last year" is a positive statement.

Normative statements are about value judgments, about what ought to be. A normative statement usually expresses ethical standards and values. Peoples naturally accept those normative statements that fit their own values and reject those that do not. "Thus six percent unemployment is too high", is normative comparing the fact of sin percent unemployment a standard of what is unreasonable. We may conclude that economics is not only a positive science of what is but also a normative science of what ought to be.

b) Deduction and Induction methods

The two methods of scientific study of economics are Deduction and Induction. As a matter of facts, deduction and induction are the two forms of logic that helps to establish the truth. Deduction proceeds from the general to the particular while induction, proceeds from the particular to the general.

The deductive methods

It involves the certain steps

a) The formulation of assumption on the basis of which the factors are to be analyzed.

b) The process of logical reasoning where by inferences are drawn. Inference is the process by which we arrive at conclusion for given propositions.

c) The final step relates to the verification of conclusions arrived at the conclusion agree with observation facts, the hypothesis is verified.

Merits of Deduction

i) This method is nearer to reality.

ii) This method is simple because it is analytical.

iii) The use of mathematics in deduction brings exactness and clearly in economic analysis.

iv) Use of the mathematical deductive method helps in revealing inconsistencies in economic analysis.

v) This method helps in drawing inference, which is of universal validity because they are based on general principles, such as the law of diminishing returns.

Demerits of Deduction

The chief defect of the deductive method lies in the facts that those who follow this method may be absorbed in the framing of intellectual toys and the real world may be forgotten in the intellectual gymnastics and mathematical treatment.

The Inductive Method

The inductive method involves four stages

(i) Observation

(ii) Formations of hypothesis

(iii) Generalization

(iv) Verification

Merits of Inductive Method

(i) The inductive method is realistic because it is based on facts and explains them as they actually are.

(ii) Induction helps in further inquiries

(iii) With the rapid development of science of statistic. The inductive method makes use of the statistical method

(iv) The inductive method is dynamic

(v) A generalization drawn under the inductive method is often historic relative in economics.

Demerits of Inductive method

(i) Induction relies on statistical number for analysis.

(ii) Definition, sources and method used in statistical analysis differ from investigation to investigator even for the same problem. as for instance in the case of national income accounts.

(iii) This method is not only time consuming but also costly.

(iv) The use of statistics in induction cannot prove a hypothesis.

Conclusion

The above analysis reveals that independently neither deduction nor induction is helpful in scientific enquiry. In reality, both deduction and induction are related to each other because of some facts. They are two forms of logic that are complementary and co-relative and help to establish the truth. The two methods are combined in physical sciences for the indirect verification of hypothesis and verification of laws.

Microeconomics and Macroeconomics

The subject matter of modern economics is generally divided in to two parts; Microeconomics and macroeconomics. Microeconomics and macroeconomics are two approaches to economic problem and analysis. The former relates to study of individual economic units while the latter is a study of the economy as a whole.

Ragnes Frisch was the first to use the terms "micro" and "macro" in economics in 1933. But as methodological approaches to economic problems, they originated with Adam Smith and the Mercantalists respectively. Macroeconomics as the method of analysis started with Smith and culminated with Marshall. Macroeconomic analysis preceded microeconomics Malthus, Sismondi and Marx in 19th century dealt with macroeconomic problems. Walras, Wicksell and Frisher were the modern contributors to the development of macro-economic analysis before Keynes. At present, the distinction between the two approaches has resulted in the characterization of price theory as micro-economic theory and income analysis as macroeconomic theory.

Microeconomics

Definitions-

Microeconomics is the study of the economic behavior of individual households and firms and the determination of the market prices of individual goods and services.

According to Gardenor Ackley, Microeconomic deals with the division of total out put among industries, products, firms and the collection of resources among the competing

groups. It considers problems of income distribution. Its interest is in relative prices of particular goods and services.

The term Microeconomics is derived from the Greek word Micro, which means small and which is this case indicate an emphasis on the behavior of small economic units. This microeconomic is concerned with the element of economic activity, the firm and the consumer. Its goal is to study, given the level of aggregate output in the economic, how resource (input) are allocated between different individual output, how the prices of individual goods are determined and how the total production output is shared among those who participate in the total production.

Microeconomics studies the manner in which price of the individual commodities and services are determined. It also studies

i) How resources are allocated for the production of particular goods and services.

ii) How the goods and service are distributed among the people.

iii) How efficiently they are distributed.

Importance of micro-economics

Following are the importance of microeconomics

i) **To understand the working of economy:** Microeconomics is of utmost importance in understanding the working of a free enterprise economy. In such economy there is no agency to plan and co-ordinate the working of the economic system. Such decisions as how to produce, what to produce, and for whom to produce, how to distribute and what to consume are taken by producers and consumers without any extraneous force.

ii) **To provide tools for economic policies:** Microeconomics provides the analytical tools for evaluating the economics policies of the state. Price or market mechanism is the tool, which helps us in this respect.

iii) **Helpful is the understanding the problem of taxation:** It also helps in understanding some of the problem of taxation and international trade. It is used to explain the welfare implications of a tax.

iv) **Helpful in the efficient employment of resources:** It deals with the economizing of scarce resources with efficiency. The principal problem

faced by modern govt. is the allocation of resources among competing ends. In this sense, microeconomics is used by the government is the efficient employment of resources and achieving growth with stability.

v) **Help to business executive:** Microeconomics helps the business executive in the attainment of maximum productivity with existing resources. It is with its help that he is able to known the consumer demand and calculate the costs of his product.

vi) **Helpful in international trade**: In the field of international trade. It is used to explain the gains from international trade, balance of payments, disequilibria and the determinations of the foreign exchange rates.

vii) **To examine the conditions of economic welfare:** Microeconomic can be used to examine the conditions of economic welfare. According to R.A Bilas "That is, to examine the subjective satisfactions that individual derive from consuming goods and services and from enjoying leisure. It involves the study of welfare economics, which is one of defining an ideal economy"

viii) **The Basis for Prediction**: According to Bilas, "Microeconomics theory can be used as the basic for prediction. This does not mean that it will enable us to predict the future. Rather, it will enable the professor to make conditional predictions. These conditions have the following form: if something occurs, then a certain set of results will follow. We should be able to study government policies affecting prices of commodities and wages, for example and see whom thus policies affection the allocation of resources".

ix) **Construction and use of models for actual economic phenomena.** Microeconomics constructs and uses simple models for the understanding of the actual economic phenomena.

Limitation of micro-economic

i) It is base on the unrealistic assumption of full employment in the economy. The microeconomic is an unrealistic method of economic analysis.

ii) Microeconomics is based on the assumption of Laissez-faire. But the policy of Laissez-faire is no longer practiced. So this makes the study unrealistic.

iii) Microeconomics is concerned with the study of parts and neglects the whole.

iv) For microeconomic is not indicates but also misleading in analyzing several

economic problems. It is not essential that principles, which are true in the case of a particular household, firm and industry may also be correctly applicable to the economy as whole.

Macroeconomics

Definitions

Macroeconomics is the study of large-scale economic phenomena, especially inflation, unemployment and economic growth.

The term macroeconomic comes from the Greek word *macro*, which means large. So the macroeconomic is the study of the economic as a whole of the aggregate national income, of the total consumption and demand of total savings, total investments and employment in the system. It deals with the aggregate and averages of the system rather than with particular port of it and attempts to define this aggregate in a useful manner and to examine how they are related and determined.

Macroeconomics is the study of the manner in which the total employment, output, saving and investment in the economy as a whole are determined.

Importance of macroeconomics

i) To understand the working of the economy

The study of macroeconomic variable is indispensable for understanding the working of the economy. Our main economic problems are related to the behaviors of total income, output, employment and the general price level in the economy. These variables are statistically measurable, thereby facilitating the possibilities of analyzing the effects on the functioning of the economy.

ii) In economic policies

Macroeconomics is extremely useful from the point of view of economic policy. Modern government, specially of the underdeveloped economies. are controlled with innumerable national problems such as over population, inflection balance of payments etc

iii) In general unemployment

The Keynesian theory of employment is an exercise in macroeconomics. The general level of employment in an economy depends up on effective demand.

Which is turn depends on aggregate demand and aggregate supply functions. Unemployment is thus caused by deficiency of effective demand. In order to eliminate it, increasing total investment, total output, total income and total consumption should raise effective demand.

iv) In Nation income

The study of micro economy is very important for evaluating the overall performance of the economy in terms of national income.

v) In economic growth

The economics of growth is also a study in macroeconomics. It is on the basis of macroeconomics that the resources and capabilities of an economy are evaluated.

vi) In monetary problems

It is in terms of macroeconomics that monetary problems can be analyzed and understood properly. Frequently changes in the value of money-inflation or deflation- affect the economy adversely

vii) In business cycles

Further macroeconomics as an approach to economic problems started after the Great Depression. Thus its importance lies in analyzing the causes of economic fluctuations and in providing remedies.

viii) For understanding the behavior of individual units

Last but not least, for understanding the behaviors of individual units, the study of macroeconomics is imperative.

Limitations of Macroeconomics

i) Fallacy of composition

In macroeconomic analysis the "fallacy of composition" is involved, i.e. aggregate economic behaviors is the sum total of individual activities. But what is true of individuals is not necessarily true of the economy as a whole.

ii) To regard the aggregates as homogeneous

The main defect in macro analysis is that it regards the aggregates as

homogenous without carrying about their internal composition and structure.

iii) Indiscriminate use of macroeconomics m misleading.

An indiscriminate and uncritical use of macroeconomics in analyzing the problems of the real world can often be misleading.

iv) Statistical and conceptual difficulties

The measurement of macroeconomic concepts involves a number of statistical and conceptual difficulties. These problems relate to the aggregation of microeconomic variables.

CHAPTER III
DEMAND AND SUPPLY

Demand: The quantity of a product or services which buyers will purchase at the different prices in a market at a given period of time or simply quantities of goods that consumer wish to buy the process of good.

Or

It is the desire for a commodity backed up by resources i.e. man money and material.

Or

The willingness or the ability of buyer to purchase under specified condition.

Demand schedule: the tabular expression/representation of quantity demanded at the different price level. A demand schedule is usually expressed as:

$$Q = f(P_q)$$

Where,

Q = Quantity demanded

P_q = Price per unit of Q

Demand curve: The spatial representation of price and quantity demanded pairs on a two dimensional space.

There is inverse relationship between price and quantity demanded, means at higher price people wants to buy fewer goods and at lower price they would be willing to buy more. Generally there is a downward slope in demand curve and there is two major reasons for that:

(1) Substitution effect: As the price of goods increases the substitute for it (at relatively lower price) is more preferable.

(2) Income effect: As the price of goods increases the consumer purchasing power decreases.

Demand function and demand equation

Demand function is a mathematical expression of the relationship between the quantity demanded of a commodity and factors affecting the quantity demanded. For e.g. the quantity of fish demanded is determined by the price of the fish, price of the substitute, income levels, the population, average educational level etc. the demand function is

expressed as

$$D_t = f\ (P_t, P_s, Y_t, S_t, E_t, D_{t-1})$$

Where,

D_t = quantity of fish demanded

P_t = price of fish in period t

P_s = price of the substitute

Y_t = Average income level

S_t = size of the population in period t

E_t = average level of education in period t

D_{t-1} = quantity of fish demanded in period t-1

A demand equation is a simple two-variable relationship between quantity demanded and price of a product in expressing a demand equation. The general mathematical expression of a demand equation is

$$D = f\ (P)$$

D = quantity of fish demanded

P = price of fish

f = function

A straight-line demand equation is expressed as

$$D = a - bP$$

D = quantity demanded of fish

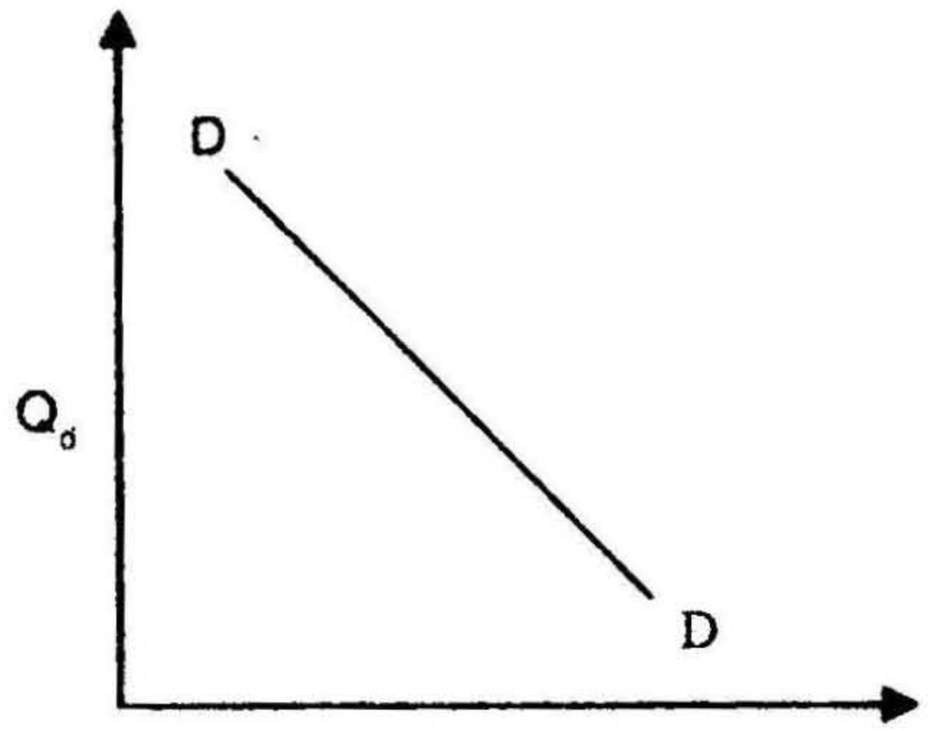
a = the intercept

b = slope of the demand curve

P = price of fish

The negative sign of the b coefficient ensures that the demand curve slopes downwards

Law of demand: It states the inverse relationship between quantities demanded and price of that particular commodity i.e. as the price of the commodity increases its demand decreases and vice versa.



Price

Fig. 3.1: Demand curve

Change in quantity demanded and change in demand:

Change in quantity demanded is not the same as change in demand. A change in quantity demanded means a change along the demand curve (as the price of the fish increases, the quantity demanded decreases and vice versa). Thus change in the quantity demanded is caused through a change in the price, keeping all the other factors constant. The change in demand is altogether a different phenomenon change in demand denotes a shift in the whole demand curve. A shift in the demand curve implies that at each price people buy different quantities. This means that at a given price the quantity demanded has changed and this change is caused by factors other than price. The factors usually leading to change in demand are the changes in income level of population.

Table3.1:Individual demand schedule for fish (hypothetical)

Price of fish (Rs/kg)	Quantity Demanded	
	Individual A	Individual B
5	40	50
10	28	35
15	18	27
20	10	15
25	6	10

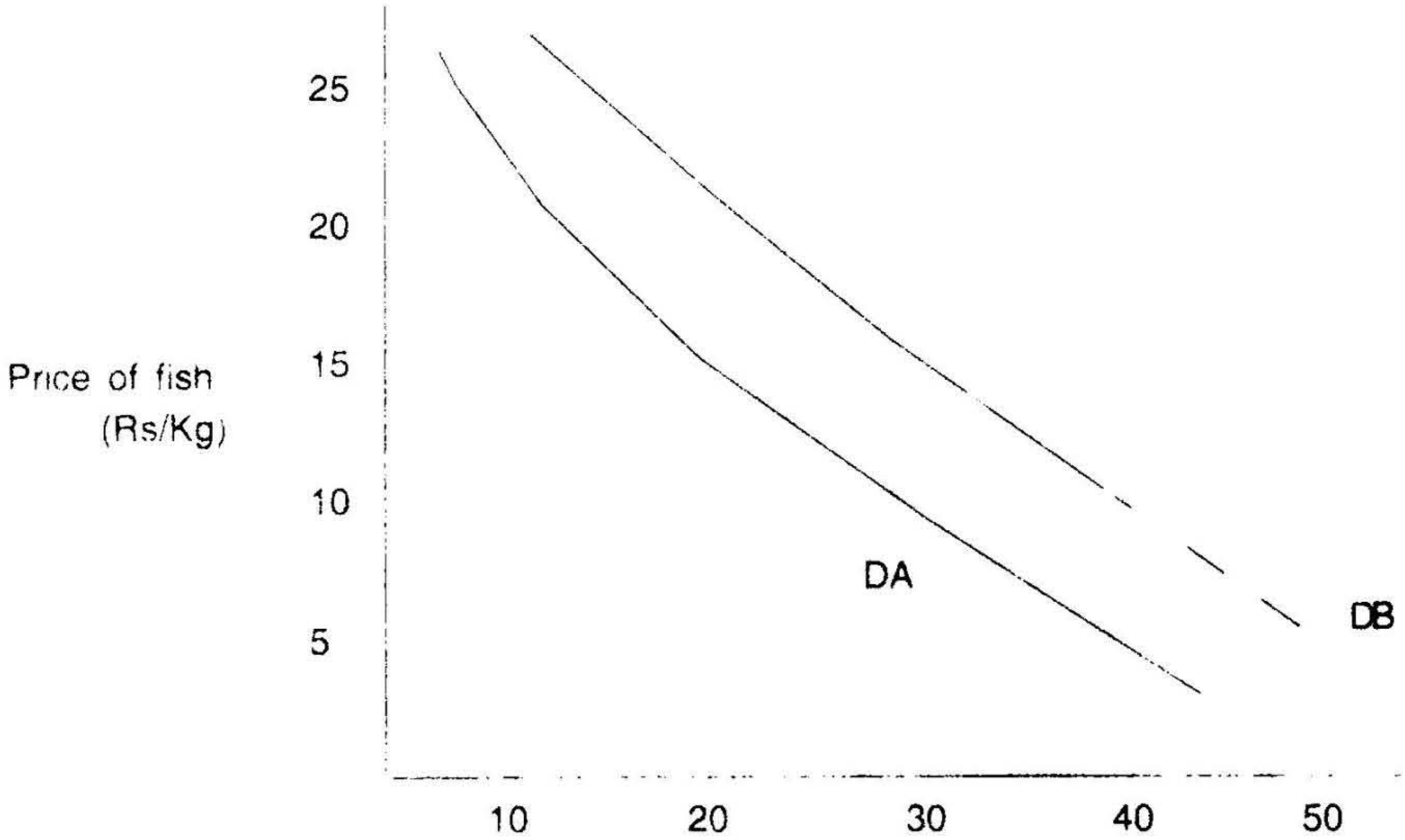


Fig 3.2: Graph showing change in demand / the demand curve shift

The quantities demanded at different prices are shown in the above demand schedule and the graph. DA represents the demand of the individual A and DB represents the demand of the individual B. Graphically increase in demand means a shift in the demand curve towards right. The change in demand should be clearly distinguished from the change in quantity demanded. A change in demand means a shift in the demand curve or schedule and this may be due to the changes in the income level. When the income of the person increases, the quantity demanded of a product will also increase i.e. change in income has an effect on the quantity demanded. Whereas a change in quantity demanded connotes a change along the demand curve

Types of demand

- Effective Demand: Effective demand is the desire of the consumer backed up by his purchasing power. i.e. how much will be bought at a price and how much is needed or desired.
- Derived Demand: The demand for some commodities exist only because they are used in producing other commodities which satisfy human wants. The demand for such commodities is terms are derived demand
- Reservation demand: At each price, the seller himself has a demand to keep a certain quality with himself for later sale. He may not sell if the price offered is lower

than some preconceived price which is known as reservation demand or price schedule.

Individual demand. consumer demand and market demand

The individual demand is a set of quantities demanded at different prices by an individual consumer at a specified time and place in addition to other factors. A set of price-quantity demanded pairs for an individual is referred to as an individual demand. It can be expressed as individual demand schedule, individual demand curve or individual demand equation The demand for a consumer good by all consumers taken together referred to as total consumer demand or final demand. Total consumer or final demand is a set of quantities which all the final consumers are ready to buy at different prices The market demand is the sum total of demand of individuals. It shows the quantities demanded by all the individuals in the market at different prices at specified time, space and levels of other factors. Market demand is the horizontal summation of individual demand curves

Table3.2 Individual and market demand schedule for fish

Price of fish	A	B	Market demand
5	40	50	90
10	28	35	63
15	18	27	45
20	10	15	25
25	6	10	16

Factors affecting demand

The factors affecting demand vary from product to product. Agricultural products can be divided into 4 categories in order to identify the factors affecting demand.

- Products that are directly consumed in the form they are produced (fresh fish)
- Products which need some processing which is usually done by the final consumers
- Products which are necessarily processed before they can be consumed
- Products which are processed in a number of stages to yield the final product

1 **Individual consumer demand**: The factors affecting the demand for a product by individual families are

- Size of the family and composition
- Family income

- Availability of substitutes and their prices.
- Proportion of income spent on the commodity
- Extent of habitual consumption
- Educational level of the family
- Stocking behavior of the family

2. **Total or market demand:** The factors affecting market demand for an individual product are:
   - Size of the population and its composition by age, sex and education
   - Income level and pattern of distribution of income
   - Share of total income spent on the commodity
   - Availability of substitutes and their prices
   - Changing pattern of tastes, habits and preferences
   - Possibilities of development of processing facilities
   - Facilities available for storage and transportation
   - Imports, exports and international prices

Derived demand

Traders buy a farm product because they know that it can be sold to the consumers. Farmers have a demand schedule for the seeds, fertilizers etc because they know that there is a demand for products resulting from the use of these inputs. If there is no demand from the consumers, no farmer will demand any input and no trader will demand these farm products. Such demands are called the derived demands. The demand for fish by a whole seller is derived from the demand for the fish by the processors or the consumers. The demand for fish of the processor is derived from the demand for the different product styles by the final consumers or for export purpose. Similarly, the demand for farm inputs is derived from the demand for farm products, the production of which requires the use of these inputs.

Income and price elasticity of demand

Any elasticity is simply a ratio between a cause and an effect, always in percentage terms.

$$\text{Elasticity} = \frac{\text{Effect}}{\text{Cause}} = \frac{\text{Percentage change in Q}}{\text{Percentage change in P}}$$

The demand price analysis revolves around the following three objectives:

1. To know the impact of prices and income on demand through the estimation of demand functions.
2. To forecast the quantities likely to be demanded and/or prices of commodities in the short or long run.
3. To know the impact of various policies that may affect the demand for a commodity or group of commodities.

Of these the first one is the central theme of demand analysis. The impact of prices and income on demand is assessed through estimation of elasticities of demand. The three types of elasticities of demand are

1. Direct price elasticity of demand
2. Cross price elasticity of demand
3. Income elasticity of demand

Direct price elasticity of demand: It is the numerical measure of change in the quantity demanded of a commodity in response to a change in its price. It is the ratio of proportionate change in the quantity demanded to proportionate change in its price.

$$E_p = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in its price}}$$

Cross price elasticity of demand: It is the responsiveness of the quantity demanded to a change in the price of other consumer goods. If two commodities are substitutes, then the cross price elasticity of demand is positive indicating that the increase in price of a commodity will cause an increase in the demand of the other commodity. if two commodities are complementary in nature, then the cross price elasticity of demand is negative which means that the increase in price of one commodity decreases the quantity demanded of other commodity

$$Ep\ (ij) = \frac{\text{Percentage change in quantity demanded of i}}{\text{Percentage change in price of j}}$$

Income elasticity of demand: It is the ratio of percentage change in demand to percentage change in income. Income elasticity of demand is positive which implies that an increase in income leads to increase in the demand of the commodity and negative implies that with an increase in income, the demand decreases.

$$Ep = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}$$

The other four concepts of income elasticity of demand are

1. Quantity-income elasticity of demand = % change in quantity consumed / % change in Income
2. Value – income elasticity of demand = % change in expenditure on a commodity / % change in income.
3. Quantity expenditure elasticity of demand = % change in quantity consumed / % change in total expenditure
4. Value expenditure elasticity of demand = % change in expenditure on a commodity / % change in total expenditure

Estimation of price and income elasticities of demand: The estimation of price and income elasticities of demand has been explained on the basis of certain approach.

1 **Linear expenditure system approach:** When the income variation is small, the linear expenditure system provides a reasonable fit. This method allows substitution among consumer items. The linear expenditure system has the following form

$$P\,q = P\,C + bi\,(m - P\,C) + U$$

$$t = 1,2.....n \;\; ; t = 1,2.....T$$

Where

P = price of ith commodity in period t

q = quantity consumed of the ith commodity in period t

C = committed quantity of the ith commodity

b = marginal budget share of ith commodity

m = total consumption expenditure in period t

n = number of commodities in the consumer budget

t = number of time periods for which observations are available and

U = random disturbance term with usual properties

The direct price elasticity of demand for ith commodity is obtained by the following formula

$$Ep = \frac{(1-b)\,PC}{mW} \quad \text{- 1}$$

Where,

Ep = price elasticity of demand
b = budget share of the ith commodity
C = committed quantity of ith commodity
m = total consumption expenditure in period t
P = Price of ith commodity in period t and
W = pq/m

Relationship between price and income elasticities: There is an important relationship between the magnitude of price and income elasticities of demand for a commodity (or group). The relationship flows from the assumption that demand function is homogenous of degree zero. Let us look at this with the help of the following specification of a general demand function.

$$D1 = f(P1, P2, P3..., Y)$$

Where,

D1= demand for commodity 1
P1 = price for commodity 1
P2...P4= prices of substitute/complementary commodities
Y =income

A function is said to be homogenous of degree zero if equal percentage change in all the explanatory variables leaves the dependent variable changes.

$$ep_{11} + ep_{12} + ep_{13} + ep1y = 0$$

This equation states that sum of direct price elasticity, all cross price elasticities and income elasticities and income elasticities of demand is zero.

$$-ep_{11} = ep_{12} + ep_{13} + ep1y$$

This equation states that the negative of direct price elasticity of demand is equal to the sum of cross price elasticities and income elasticities of demand.

ep_{11}= direct price elasticity of demand
ep_{12} and ep_{13}= cross price elasticities of demand
ep1y= income elasticity of demand

Supply: Supply refers to schedule or quantities of a product that will be offered for sale at different prices at a given time and a given market.

Supply schedule: The tabular representation of quantity supplied at different price level. The relationship between the supply and price of the commodity.

Supply curve: The graphical representation of quantity supplied pairs in a two dimensional space. The supply curve is upward slope i.e. positively sloped.

Law of supply: It states the positive relationship between price and supply i.e., when price increases, quantity supply also increases and when price decreases quantity supplied decreases.

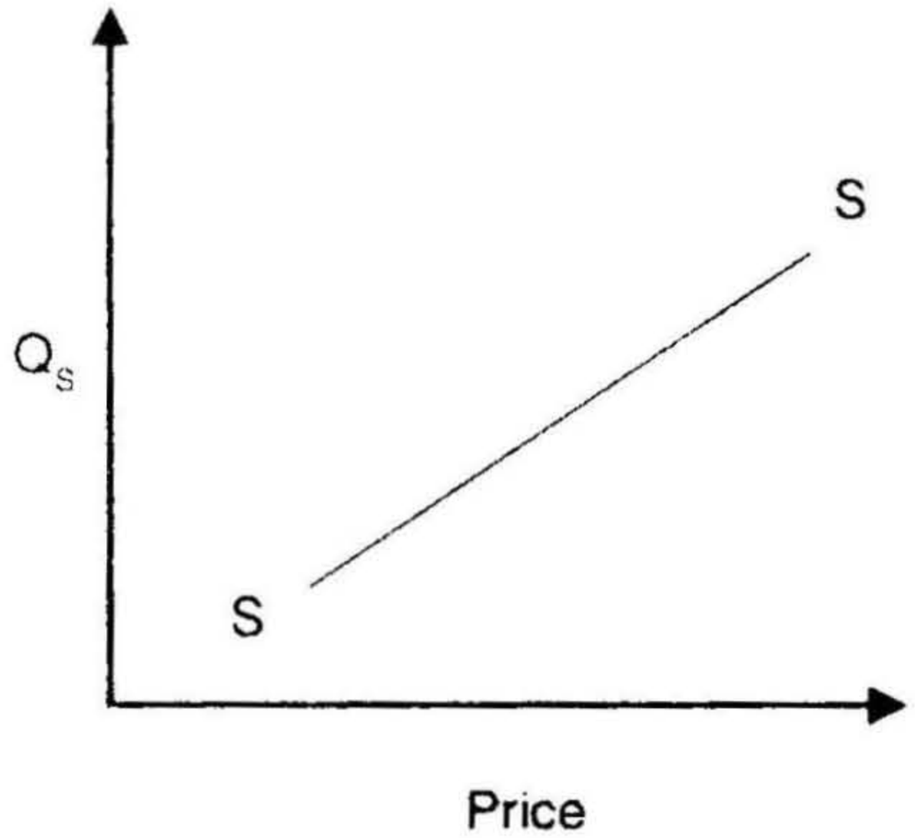


Fig 3.3: Supply curve

Change in quantity supplied and change in supply:

A change in quantity supplied means a change along the supply curve. The movement which is part of the supply schedule is termed as a change in quantity supplied.

The term change in supply connotes a shift in the whole supply curve. A change or shift in the supply curve implies that at each price, the producers supply different quantities. In other words it means that at a given price the quantity supplied has changed. In the case of supply of fish, the change in supply is caused by the factors other than price. The factors usually leading to the change in supply from year to year are, area under production, level of technology adoption and weather conditions.

Price elasticity of supply and supply response:

The price elasticity of supply is a numerical measure of change in the quantity supplied of a commodity in response to a change in its price.

$$e_s = \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}$$

$$e_s = \frac{DQ/Q}{DP/P} = \{DQ/DP\}\{P/Q\}$$

Where,

e_s= Price elasticity of supply;

Q= Quantity supplied of a commodity;

P= Price of the commodity;

D= Change.

Cobweb model of supply and demand price interaction:

The cobweb model is a simplified presentation of supply-demand price interaction. It is a simplified presentation in the sense that it ignores other factors which affect the supply and demand and assumes that the supply of a commodity in a period affects its price in the same period through the demand-price relationship and the price during a period affects its supply in the following period through supply price relationship. In the case of aqua cultural commodities, while the production during a year affects the prices during the same year, the prices, in turn, affect the supply in the next year. This lag in the supply to respond to prices gives rise to a phenomenon which is termed as cobweb. It is a simplified, yet very revealing, and analysis of supply- price- demand interaction. To understand it clearly it has to be assumed that;

$$D_t = f(P_t) \text{ or } P_t = f(D_t) \quad \text{(demand)}$$

and $$Q_{t+1} = f(P_t) \quad \text{(supply)}$$

$$D_t = Q_t$$

Where,

Dt= Quantity demanded in period t,

Qt= Quantity supplied in period t and

Pt= Price in period t.

Equilibrium price: As stated by the laws of demand and supply there would be a continuous fluctuation in the price of the commodities but there would be price at which the balance is struck between the price and the quantity that both of them remain constant. This can be diagrammatically represented as:

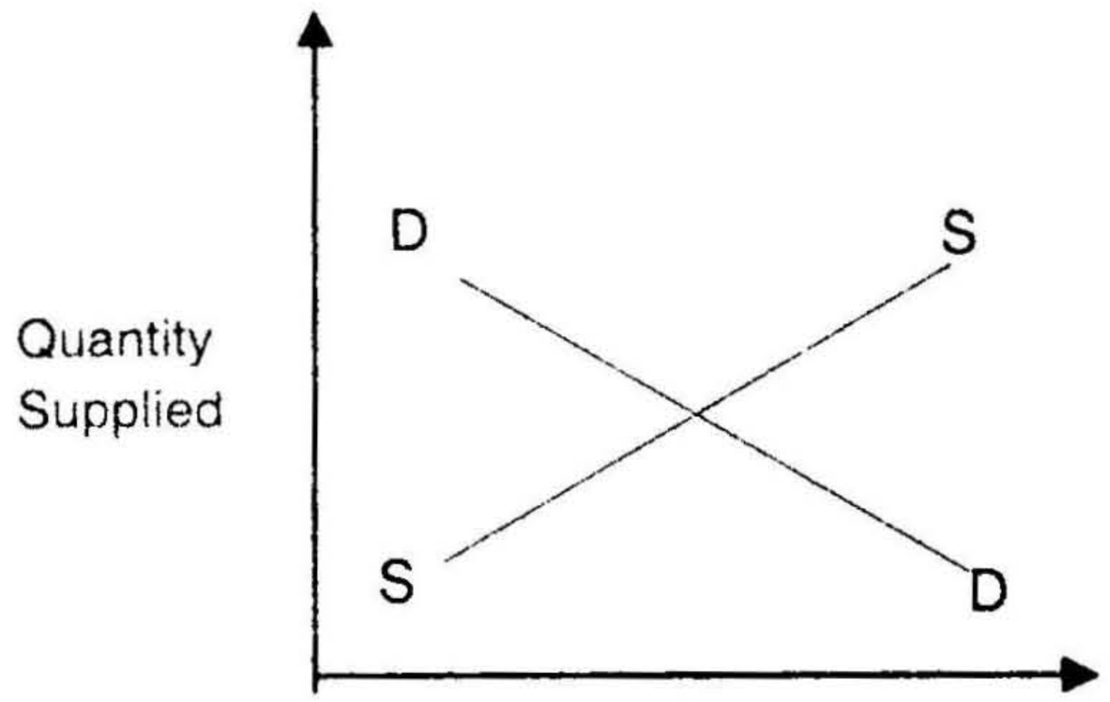


Fig 3.4: Equilibrium price

Utility-analysis

In simple words utility means satisfying quality or power of a good and services at a particular time is called utility.

Utility differs from usefulness

A commodity may satisfy a human want, but may not be useful. For example-opium and poison, but because they satisfy human wants and some people are ready to pay for them, means they have utility for them. So a thing may be good or bad, but if it satisfies a human want, means it possesses utility.

Utility is not synonymous with pleasure

A good, which posses utility, may not give pleasure when consumed e.g., quinine, bit in spite of it's bitter taste quinine is purchased and consumed, for it does fulfill a need. Hence utility is not the same thing a pleasure.

Utility is subjective

No commodity possesses utility in itself independent of the consumer. It is the consumer mind, which gives it utility. A blind man cannot see a film; it has no utility for him .A cigarette has no utility for nonsmoker. Utility varies from individual to individual. Even for the same individual, a commodity may possess different utilities at a different time or in different places. A warm suit has greater utility in winter than in summer. It all depends on man's circumstances. That is why utility is subjective.

Forms of utility

1. **Form utility**-By changing the form of an article; we can give it greater utility, e.g.; the transformation of a log of wood into a piece of furniture.

2. **Place utility**-Utility can also be increase by transporting a good from one place to another

   When timber is brought to the market, it comes to have much greater utility than it had in forest.

3. **Time utility**-By storing a commodity and selling it at a time of scarcity, we can give it greater utility.

4. **Possession utility**: The utility, which is rested with the right and authorized.

The cardinal utility theory: It is based on following assumption

1- **Rationality**: The consumer is rational. He aims to maximization of his utility subject to the constraint imposed by his income.

2- **Cardinal utility**: The utility of each commodity is measurable. Utility is a cardinal concept. The most convenient measure is money; the monetary units that the consumer is prepared to pay for another unit of commodity measure the utility.

3- **Constant marginal utility of money:** This assumption is necessary, if the monetary unit is used as measure of utility. The essential feature of a standard unit of measurement is that it should be constant if the marginal utility of money changes as income increases the measuring rod for utility becomes like an elastic ruler, inappropriate for measurement.

4- **Diminishing marginal utility:** The utility gained from successive units of commodity diminishes. In other words, the marginal utility of commodity as the consumer acquires larger quantities of it.

5- **Total utility**: The total utility of a basket of goods depends on the quantities of the individual commodities. If there are n commodities in the bundle with quantities x1, x2, ...xn then total utility is

$$U = f\ (x1, x2, ...xn)$$

The cardinal utility means the utility can be measured. Under the certainty (complete knowledge of market condition and income level over the planning period) it has been suggested that utility can be measured in terms of notary units, by the amount of money the consumer is willing to pay or to sacrifice for another unit of commodity. Other suggested that measurement of utility in subjective units called "utils"

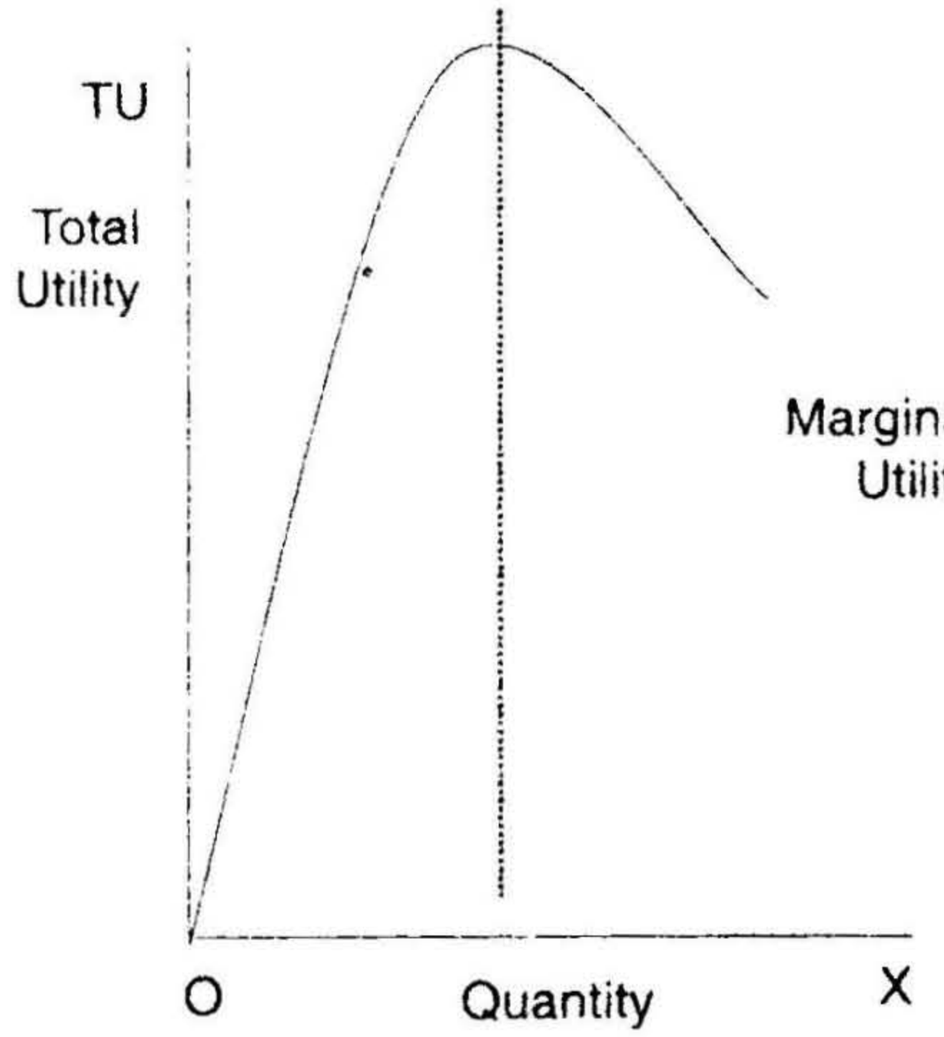


Fig 3.5:Total utility curve

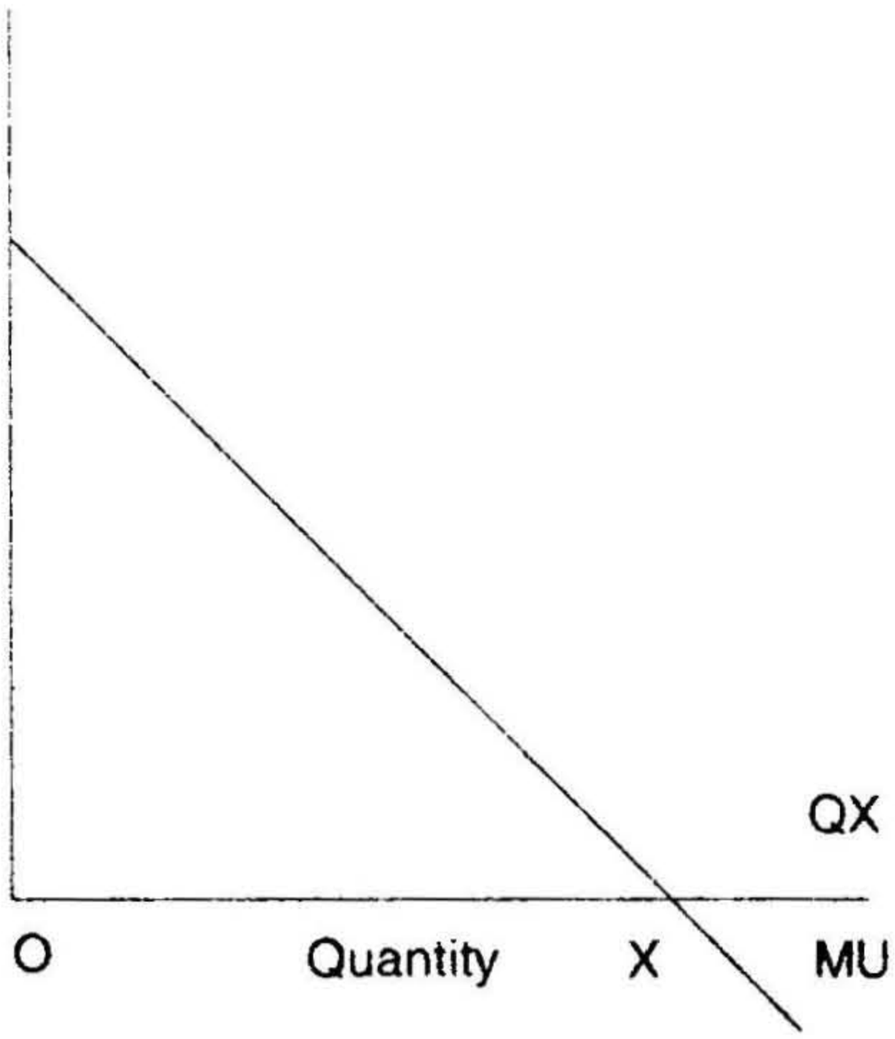


Fig 3.6: Marginal utility curve

Derivation of demand curve-

The derivation of demand is based on axiom of diminishing marginal utility. A line with a negative slope may depict the marginal utility of commodity X. Geometrically the marginal utility of X is the slope of total utility function U = f (qx). The total utility increases, but at a decreasing rate, up to quantity X, and then start declining. If the marginal utility is measured in monetary units the demand curve for X is identical to the positive segment of marginal utility

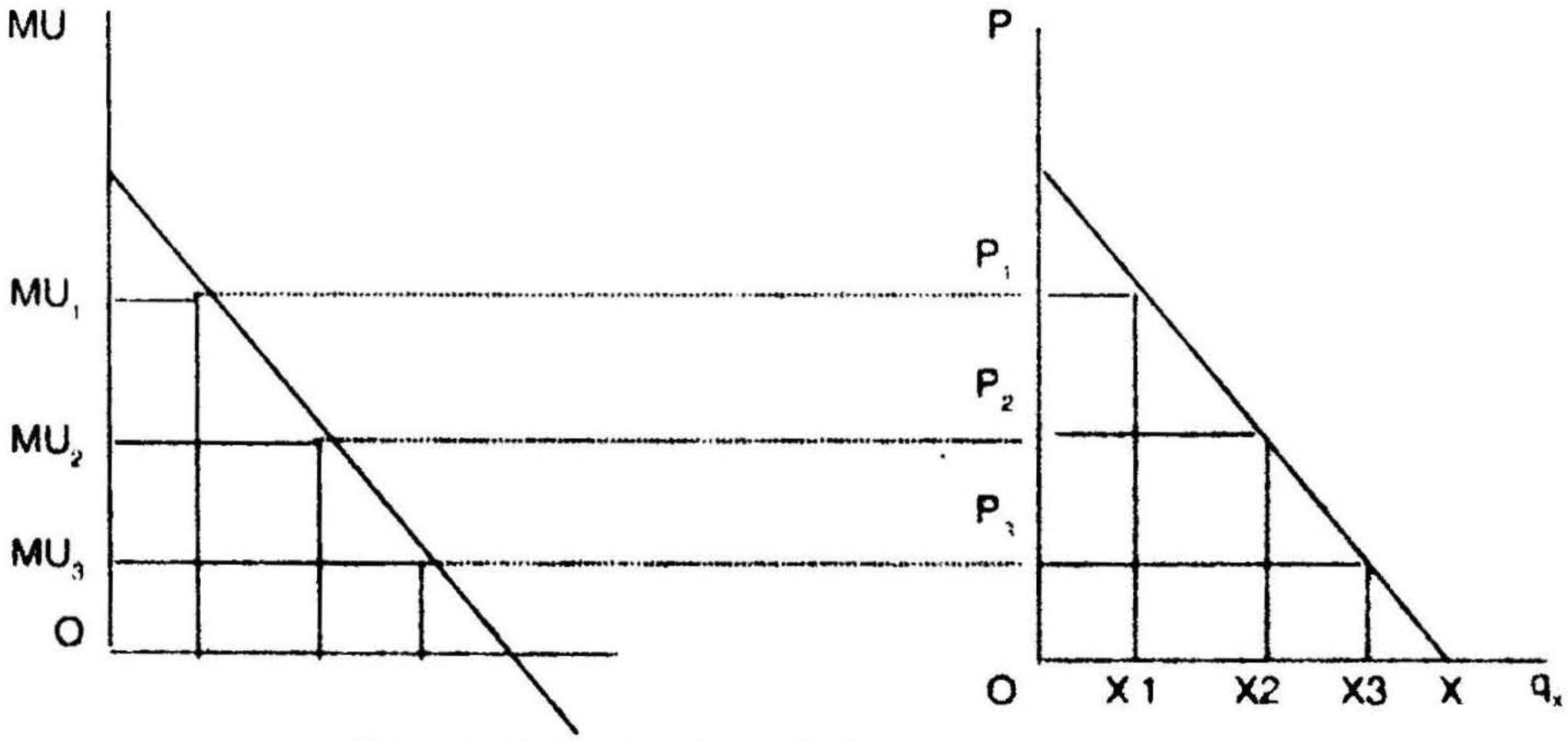


Fig 3.7: Derivation of demand curve

When consumed, e.g. At X1 the marginal utility is MU1; this is equal to P1, by definition. Hence at P1 the consumer demands X1quantity, similarly at X2 the marginal utility is MU2, which is equal to P2, hence at P2 the consumer will buy X2, and so on.

Means when higher price in the market, the purchasing power of consumer is less.

Consumer Surplus: -

Alfred Marshall define consumers surplus as the excess of price, which the consumer is willing to pay rather than go without the thing, over that he actually does pay, is the economic measure of surplus satisfaction.

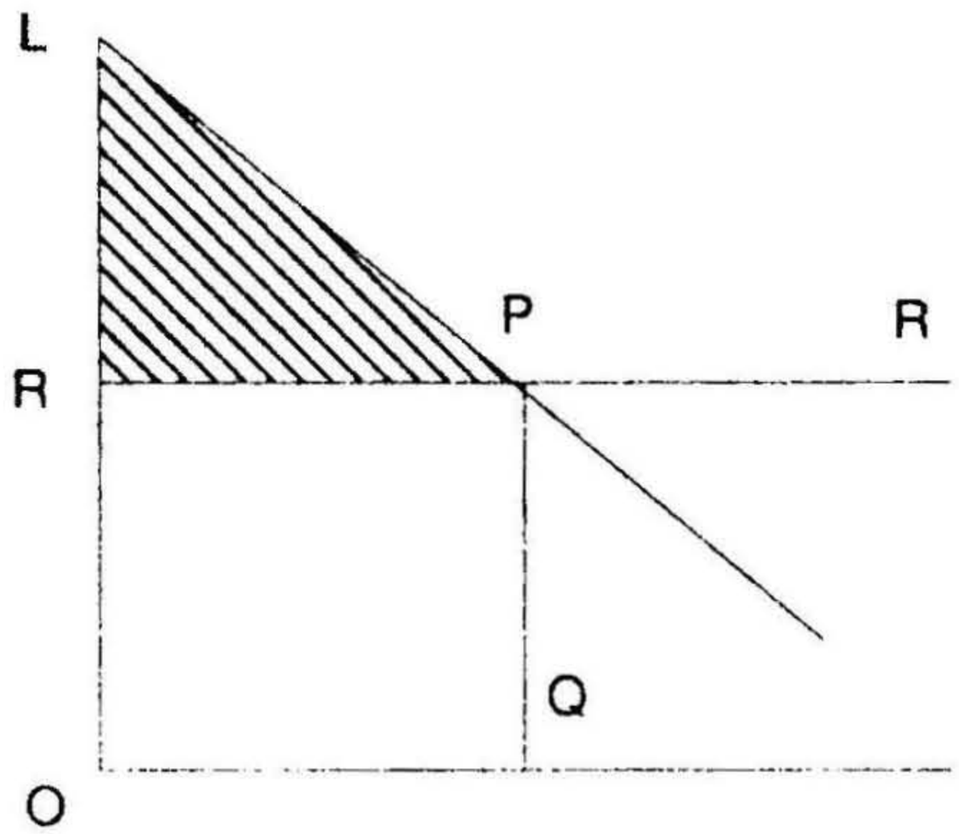


Fig 3.8: Graph showing consumer surplus

So the OLPQ - total amount of money the consumer is prepare to spend to secure OQ quantity of commodity.

OQPR - amount of money actually spent by consumer to purchase OQ quantity of goods.

So LRP is the consumer's surplus.

Assumption:

1- Constant marginal utility of money-means the marginal utility of money to the individual purchaser should be same throughout the process of exchange, means a consumer total expenditure as any one good constitute only a small part of his total money expenditure.

2- Independence of commodity-means a each commodity should be considered independent of each others.

3- Substitute of commodities-means the commodities should not have their substitute. In case there is any substitute then all substitutes should be grouped together as one commodity.

4- Consumer surplus of entire market-for calculating consumer surplus of entire market, difference in income, taste, fashion and sensibilities between consumers is to be cancelled

Criticism-

Gabby, Nicholson, and Cannon etc criticized that concept is not theoretically valid Even if it is theoretically valid, it cannot be measured in terms of money. It has no practical significance.

The Revealed Preference Theory -

Samuelson introduced the term "revealed preference"in1938. The revealed preference hypothesis is considered as a major breakthrough in theory of Demand, because it has made possible the establishment of "law of demand" directly without the use of indifference curves and all their restrictive assumption.

Assumptions-

1- Rationality- the consumer is assumed to behave rationally, in that he prefer bundles of goods that include more quantities of commodities

2- Consistency-the consumer behave consistently, means, if he chooses bundle (A) in a situation in which bundle (B) is also available to him, he will not choose (B) in any other situation in which (A) is also available to him.

If (A) > (B), then (B) > (A)

3- Transitivity-if in any particular situation

A> (B) and (B) > (C), then (A) > (C).

4- The revealed preference axiom- the consumer by choosing a collection of goods in any one-budget situation, reveal his preference for that particular collection. The chosen bundle is revealed to be preferred among all other alternative bundles available under that budget constraint. The chosen basket of goods maximizes the utility of consumer. The revealed preference for a particular collection of goods implies the maximization of utility of the consumer.

5- It is based on a simple idea, suppose a consumer decide to buy some goods

because he likes them more than others goods which are available to him or because they are happen to be cheaper. The basic idea of revealed preference theorem is that the consumer's choice reveals his preference.

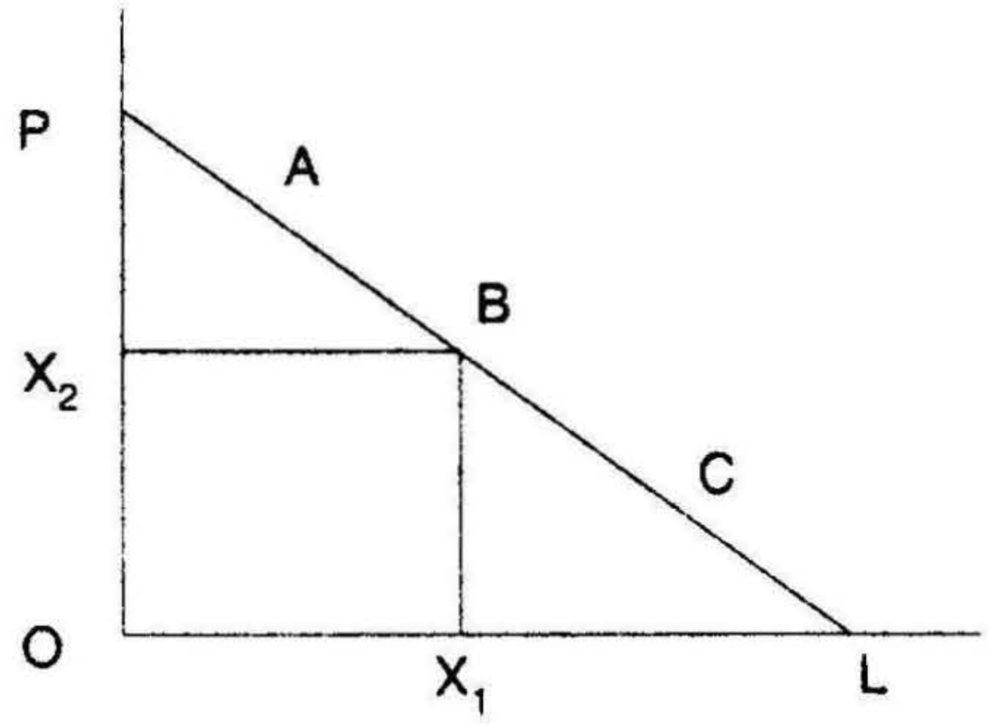


Fig 3.9 Graph showing revealed preference

Here X_1 and X_2 are two commodities, and PL is the budget line, and POL is the consumer's. choice.

So with this the consumer can choose any combination, so point "B" is equilibrium point.

In choosing A, the consumer is revealing his preference for A over all other combination that are possible, thus choice become preference.

Strong and weak ordering-

This theory is based on strong ordering; it means that there is a definite ordering of various combinations in consumer's scale of preference.

It means that when a consumer reveal his preference for one combination, he has reveal his positive and definite preference for this combination over all other which are upon to him.

In a given graph, the consumer prefers A combination to all other s such as B. But in case of weak ordering the consumer can choose any one combination, which are on budget line.

Derivation of Demand Curve-

Assume that consumer has a budget line AB and choose the collection of goods denoted by point Z, thus revealing his preference for this batch. Suppose that price of X

falls so that the new budget line is AC, it means that new batch include a larger quantity of X.

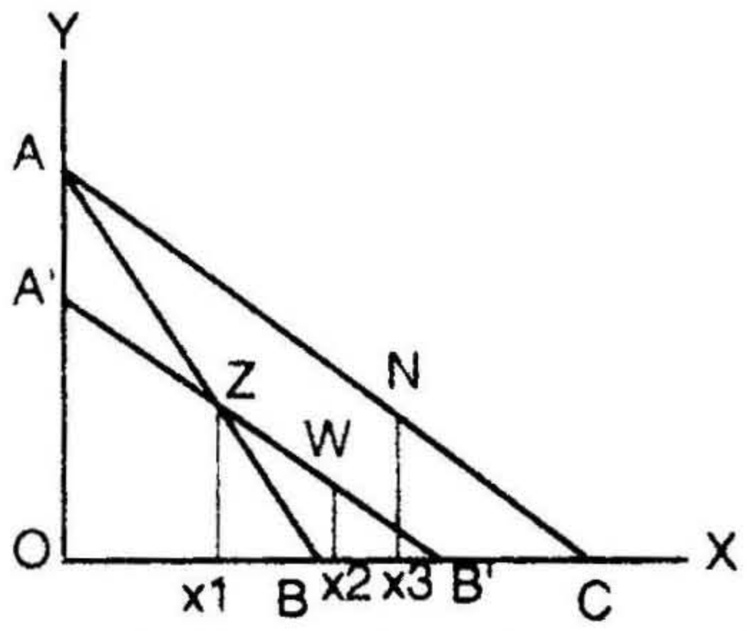


Fig 3.10: Derivation of demand curve

Compensating variation of income means a reduction in income so that the consumer has just enough income to enable him to continue purchasing Z if he wishes.

The compensating variation is shown in fig. By a parallel shift of new budget line that is compensated budget lineA'B ' passes through Z.Since the collection z is still available to him, the consumer will not choose any bundle to the left on Z on the segment A'Z, because his choice would be inconsistent, given that in original situation all the batches on A'Z were revealed inferior to Z.

Hence the consumer will either continue to buy Z or he will choose a batch on the segment ZB', such as W, which include as larger quantity of X means X2.

If we remove the reduction in income and allow the consumer to move on the new budget line AC, he will choose a batch to the right of W. The new revealed equilibrium position (N) includes a larger quantity of X means X3 resulting from the fall in price. Thus the revealed preference axiom and implied consistency of choice open a direct way to the derivation of the demand curve, means as prices falls, more of goods purchased.

The Indifference Curve Theory- (Iso Utility Curve)-

It is based on some assumptions that are as follows-

1- Rationality-the consumer is assumed to be rational-he aim at the maximization of his utility, given his income and market price.

2- Utility is ordinal-it means that consumer is able to rank his preferences according to the satisfaction of each commodity, but in this situation he don't know precisely the amount of satisfaction

3- Diminishing marginal rate of substitution-preferences is ranked in terms of indifference curves, which are assumed to be convex in origin. This implies that the

slope of indifference curves increases. The slope of indifference curve is called the marginal rate of substitution of commodities.

4- Total utility- the total utility of a consumer depends upon the quantities of the commodities consumed.

i. U = f (q1, q2,.....qx,....qy,.....qn)

5- Consistency and transitivity of choice-it is assumed that consumer is consistent in his choice, that is, if in one period he chooses the bundle A over B, he will not choose B over A in another period if both bundles are available to him.

If A > B, then B > A

Similarly, it is also assumed that consumer choice is also characterized by transitivity: means if bundle A is preferred to B, and B is preferred over C, then bundle A is preferred to C.

If A> B, and B > C, then A > C

Indifference curve

An indifference curve is the locus of point - particular combinations or bundles of goods-, which yields the same utility (level of satisfaction) to the consumer, so that he is indifferent as to the particular combination he consumes. Indifference curves labeled at higher number are preferred, because higher indifference curve represent larger combination of X and Y in compare to lower indifference curves.

Indifference map

Shows all the indifference curves, which rank the preferences of the consumer. Combination of goods situated on an indifference curve yield the same utility. Combination of goods lying on higher indifference curve yield higher level of satisfaction and are preferred. Combinations of lower indifference curves yield lower utility.

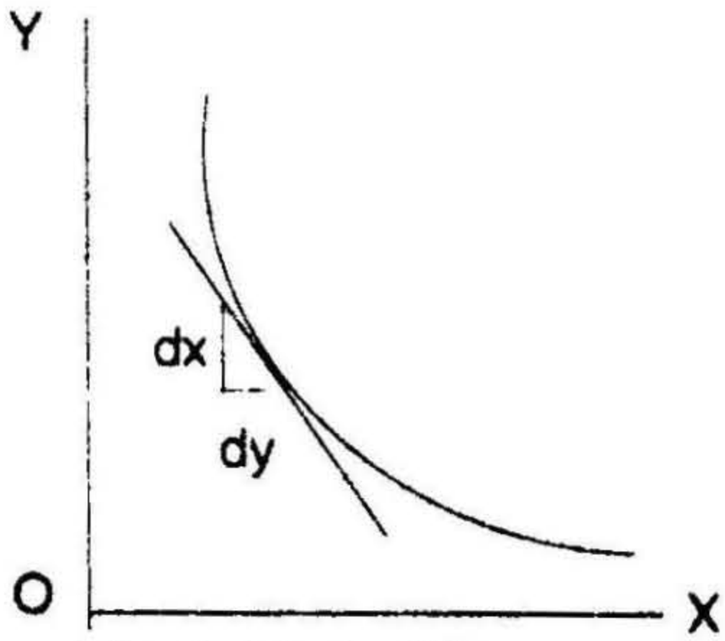


Fig 3.11: Indifference curve

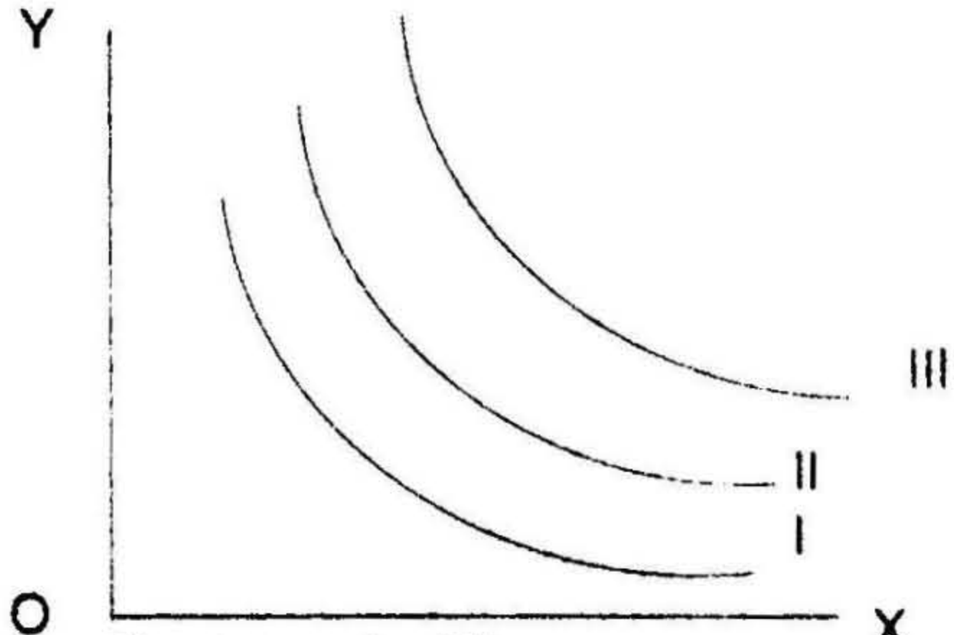


Fig 3.12: Indifference map

The negative of the slope of an indifference curve at any point is called marginal rate of substitution of the two commodities, X and Y, and is given by the slope of a tangent at that point.

$$\text{Slope of a Indifference Curve} = -\frac{dy}{dx} = \text{MRS } x,y$$

The marginal rate of substitution of X and Y is defined as the number of units of commodity Y that must be given up in exchange for an extra unit of commodity X so that the consumer maintains the same level of satisfaction.

Properties of indifference curves

1- An indifference curve has a negative slope, which denotes that if the quantity of one commodity (Y) decrease, the quantity of other (A) must increase, if the consumer is to stay on the same level of satisfaction

2- The indifference curves never intersect, if they intersect, it means that one satisfaction is at same time greater or less then as well as equal to other

3- The indifference curves are convex in origin; this implies that the slope of an indifference curve decreases as we move along the curve from the left downwards to the right, means that the marginal rate of substitution of commodities is diminishing. The axiom of decreasing marginal rate of substitution expresses that the numbers of units of X the consumer is willing to sacrifice in order to obtain an additional unit of Y.

4- Indifference curve need not to be parallel to each other. Firstly they are not based on cardinal measurability of utility, secondly the marginal rate of substitution between two commodities need not be same in all indifference curves for the consumer rate of preference of one good and for another may change with the change in his economic condition that is income.

CHAPTER IV
NATIONAL INCOME ACCOUNTING

National Income

National income of a country can be defined as the total market value of all final goods and services produced in the economy in a year. Two things must be noted in regard to this:

1. It measures the market value of annual output i.e. national income is a monetary measure.
2. In order to avoid counting several times, the parts of goods that are sold and resold, national income only includes the market value of all final goods and ignores the transactions involving intermediate goods.

The concept of national income has three interpretations

i. A total value of production.

ii. A receipt total.

iii. An expenditure total.

National income = National product = National expenditure

In other words, there are three measures of national income of a country:

a) The sum of value of all the final goods and services produced.

b) The sum of all incomes, in cash and kind, accruing to factors of production in a year.

c) The sum of consumer's expenditure, net investment expenditure and government expenditure on goods and services.

Circular Flow of Income

Money acts as a medium of exchange. The households supply the economic resources or factors to the productive enterprises and received in turn the payments in terms of money. The households use the money income so obtained to buy goods and services they want. The productive enterprises sell goods and services for money and use the money so received to pay for the households for their supply of economic resources. Thus, labour gets wages, capital gets interest, land gets rents and enterprises obtain profits, all in terms of money.

Both the households and enterprises save money. Households save when they do not spend the whole of their income on consumers' goods and services. The enterprises save when they do not distribute among shareholders all the profits made by them and keep the undistributed profits as reserves to use them later for investment purpose. We assume that all the savings whether by households or enterprises pass straight into the capital market. Capital market includes all institutes and places such as banks, insurance companies, finance houses, trunks at home, hole in the ground, etc. where people deposit or keep money.

The flow of money will continue at a steady level only when the condition of equality between planned saving and investment is satisfied. Because in a free enterprise capitalist economy, investment is made by enterprise and savings are mostly done by households and for different reasons there is no guarantee that planned investment will be equal to planned saving and thus fluctuation in income output and employment are inevitable. As a result, circular flow of income does not continue at a steady level unless certain corrective and preventive steps are taken by the government to maintain stability in the economy.

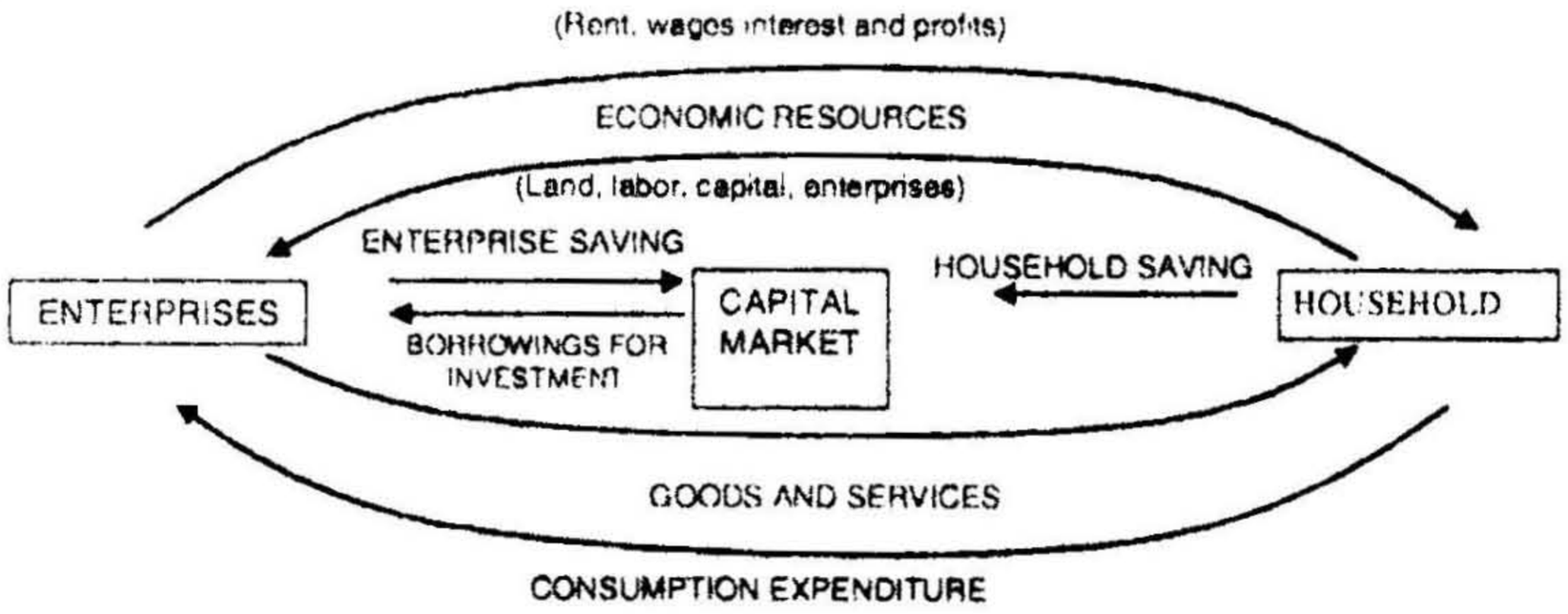


Fig.4.1 Circular flow of income with saving

Measurement of National Income

1. Output method

This method approaches national income from the output side. Under this method, the economy is divided into different sectors such as agriculture, mining, manufacturing, small enterprises, commerce, transport, communication and other services. Then the gross product is found out by adding up net values added that has taken place in various production units and industries during a given year. In order to arrive at the net value added of a given industry, the purchases of the producers of this industry from producers of other industry are deducted from the gross value of production of that industry. The aggregate of net value added of all the industries and sectors of the economy plus the

net income from abroad will give us the gross national product. By subtracting the total amount of depreciation from the figure of gross national product we shall get the net national product or income. The great advantage of this method is that it reveals the relative importance of the different sectors of the economy by showing their respective contribution to the national income.

2. **Income method**

This method approaches national income from distribution side. In other words, this method measure the national income after it has been distributed and appears as income earned or received by individuals of the country. Thus, under this method, national income is obtained by summing up of all the incomes of all the individuals of the country. Individuals earn incomes by contributing their own services and the services of their property such as land and capital to the national production. Therefore, national income is calculated by adding up the rent of land, wages and salaries of employees, interest on capital, profit of entrepreneurs and incomes of self employed people. This method of estimating national income has the great advantage of indicating the distribution of national income among the different income groups such as landlords, capitalists, workers, etc. Therefore, this is called national income by distribution shares.

3. **Expenditure method:**

This method arrives at national income by adding up all the expenditure made on goods and services during a year. We get national income by summing up all consumption expenditure and investment expenditure made by all individuals as well as by Government of a country during a year. Thus the gross national product is found out by adding up:

a) What private individual spend on consumers goods and services i.e. private consumption expenditure (C)

b) What private businessman spend on replacement, renewals and new investment i.e. gross domestic private investment (I)

c) What the government spend on purchase of goods and services i.e. government expenditure (G)

d) What the foreign countries spend on the goods and services of the national economy over and above what this economy spends on the output of the foreign countries i.e. export (X) – import (M) = net export (Xm)

$$Xm = X - M$$

Therefore, Y = C +I +G +Xn

The best way to arrive at national income will be to employ all these three methods so as to permit their crosschecking ensuring greater accuracy.

Concept of National Income

Gross national product (GNP):

It is defined as the total market value of all final goods and services produced in a year.

- GNP is a monetary measure
- It includes the market value of final goods and services and ignores transaction involving intermediate goods.

Net national product (NNP) or national income at market prices:

In the production of GNP of a year, we consume or use up some capital i.e. equipment, machinery, etc. The capital goods like machinery wear out. Fall in value of capital due to wear and tear is called depreciation. When charges due to depreciation are deducted from GNP we get net national product. Clearly it means the market value of all final goods and services after providing for depreciation. Therefore it is also called national income at market price.

NNP =GNP – depreciation

National income at factor cost (NI):

It means the sum of all incomes earned by resource suppliers for their contribution of land, labour, capital and entrepreneurial ability which go into the year's net production. In other words, national income at factor price shows how much it cost society in terms of economic resources to produce net output. The difference between NNP and NI at factor price arises from the fact that indirect taxes and subsidies cause market price of output to be different from the factor income resulting from it.

NI =NNP-Indirect taxes + subsidies

Personal income (PI):

It is the sum of all incomes actually received by all individual or household during a given year. Some incomes which are earned such as social security contributions, corporate incomes taxes and undistributed corporate profits are not actually received by households, and conversely, some incomes which are received like transfer payments are not currently earned (e g. old age pensions, relief payment, unemployment compensation, interest payment on the public debt, etc)

PI =social security contribution - corporate income taxes - undistributed corporate profit + transfer payments

Disposable income (DI):

After a good part of personal income is paid to government in the form of personal taxes, personal property taxes, etc, what remains of personal income is called disposable income.

DI = PI -Personal taxes

DI = consumption + saving

National income at current and constant prices

Since NI consists of numerous commodities, we get a measure of their output only in terms of money. We have to multiply the physical output of various commodities produced by the current market prices of these commodities in a given year to obtain their money value.

But the general price trend does not remain constant, it can rise or fall. In the last several years prices in India have been generally rising. Therefore NI in terms of money will increase simply because prices of commodities have risen rather than the rise in physical output. The economic growth consists of increase in real or physical output rather than the rise in money value of output. Therefore in order to find out whether real national output has increased, we have to adjust the national income figures for the change in prices that have taken place during a period. This is also called deflating the NI figures for the change in price. Thus through adjustment or deflation we calculate NI at constant prices.

$$\text{NI at constant price} = \frac{\text{NI at current price}}{\text{Price index}} \times 100$$

In India for measuring changes in price level, price index numbers with 1980-81 as the base has been calculated.

Table 4.1: Estimating national income at constant prices from national income at current prices

Year	NI at current prices (Rs. thousand crores)	Wholesale price index No. (1981-82 as base)	NI at constant prices (1981-82) (Rs. thousand crores)
1989-90	408.7	171.1	238.86
1990-91	477.8	191.8	249.1
1991-92	552.8	217.8	253.8
1992-93	630.2	233.2	270.3
1993-94	723.1	258.3	279.9
1994-95	854.1	285.2	299.5

Table 4.1 shows that the increase in net national product at current prices is much greater than the increase in net national product at constant (1981-82) prices. This is because prices have risen quite rapidly during the period under consideration.

Difficulties of measuring national income in India

In developing countries like India, there are some difficulties in estimating national income. Some of these are:

1. The prevalence of non-monetised transactions so that a considerable part of the output does not come into the market at all. E.g. sustenance fishing for own consumption.

2. Because of illiteracy in under developed countries most producers have no idea of the quantity and value of their output and do not keep regular accounts.

3. Occupational specialization is still incomplete, so there is lack of differentiation in economic functioning. An individual may receive income partly from fish farm ownership, partly from manual work in industry in slack season, etc. this makes the estimation task difficult.

4. Both agricultural and industrial production is unorganized and scattered in the country. This requires an element of guesswork, which is unreliable.

5. Lack of adequate statistical data. There is no accurate information available regarding consumption, investment expenditure and savings of either rural or urban population.

The Consumption Function

Keynes' consumption function relates consumption to aggregate income.

$$C = f(Y)$$

There is positive relationship between consumption and income. Since consumption plus saving equals income, the saving function equals income minus the consumption function.

$$D = Y - f(Y)$$

Consumer demand is determined for the most part by the level of national income. Consumer behavior is based on certain broad psychological assumptions:

1. At a very low income level, the average individual still needs some minimum consumption and therefore will spend all his / her income on consumption and may even dip into saving or go into debt to spend more than his / he whole current income on consumption.

2. As the individual income rises, a small percentage of it is needed to cover minimum needs, so at some break-even point he / she reaches an equality of income received and consumption spending.

3. As income rises to a very high level, consumption needs and desires may be filled through the use of a smaller portion of income, so an increasing percentage may be saved. Therefore, as income rises, the proportion of income spends on consumption declines.

Average propensity to consume:

The average ratio of aggregate consumption to aggregate income is called average propensity to consume.

$$APC = \frac{C}{Y}$$

Marginal propensity to consume:

The ratio of change in consumption to a change in income is called the marginal propensity to consume.

$$MPC = \frac{\Delta C}{\Delta Y}$$

Linear consumption function:

The simplest straight-line form of consumption function is given by

$$C = a + b\,Y$$

Where, C= aggregate consumption
Y= income
a = positive constant
b = marginal propensity to consume (between 0 and 1)

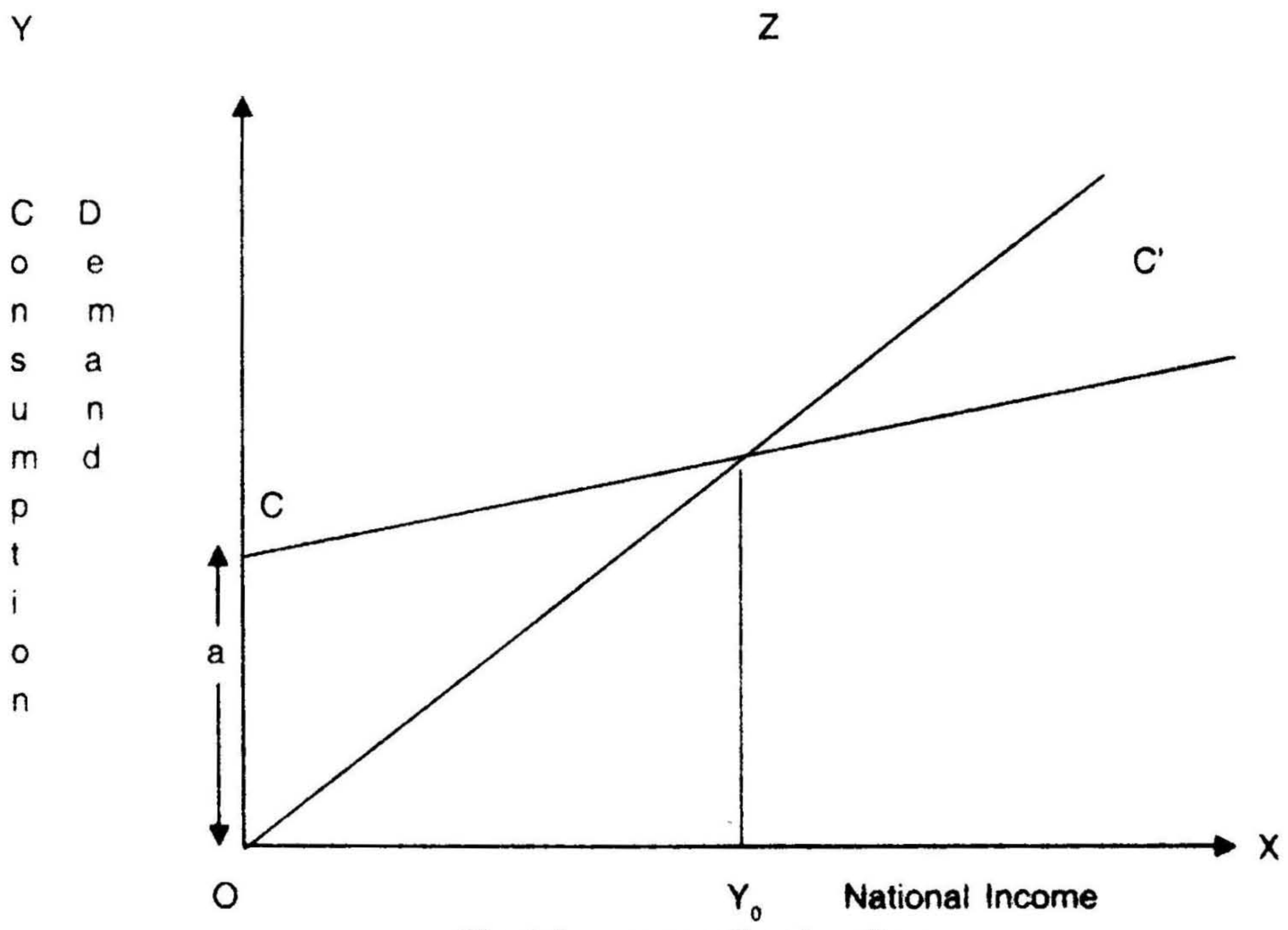


Fig 4.2: consumption function.

When income rises, consumption also rises but not as much as income, because a part of the increment in income is saved(FIG.4.2). CC' is the consumption curve. The line OZ is inclined at 45° signifies that, at any point on this line consumption is equal to the income. At lower levels of income the CC' lies above OZ line, signifying that at these lower level of incomes, consumption is greater than income. At income level OY_0 consumption is equal to income. Beyond this, with the increases in income, consumption increases but less than its income. This means saving increases with increase in income.

'a' is positive even when income is zero. The APC decline as income rises. Poor families have high APC while wealthy families have low APC. APC falls as income rises.

Factors which influences consumption function

1. **General price level:** When general price level increases (inflation) consumption function shifts downward. When general price level falls, the consumption function shifts upwards.
2. **Fiscal policy:** By levying excise duties, sales, tax, the government can cut down the consumption. Likewise, when the government reduces taxes, consumption of the people increases.
3. **Rate of interest:** Higher rate of interest induces the people to save more, which result in reducing their propensity to consume.
4. **Windfall gain and losses:** When the prices of the shares go up, the shareholders raise their consumption. On the other hand, when prices of the shares go down, they reduce their consumption.
5. **Changes in expectations:** When people expect inflation in near future they spend more to stock up goods to meet their needs in immediate future. On the other hand, when people expect the prices to fall, they reduce their current consumption so as to spend more when the price falls.

The Investment Function

Investment is defined as the expenditure of money on new plant and equipment construction and on the increase of inventories.

When a person buys shares, bonds, debentures, it is not the real investment. When individual purchases shares and bonds, someone would sell them. Thus it merely represents the change in ownership of assets, which already exits. Real investment means the addition to the stock of physical output.

Keynes sees investment as a function of the marginal efficiency of capital (MPC), which is defined as the expected rate of return on capital. This expected rate of return is inversely related to size of capital stock.

The investment is a function of the interest rate, national income and certain expectations about future sale, prices, interest rate and so forth.

$$I = f(Y, r, E)$$

Where, r is the interest rate
Y is national income
E is expectations

The functional relationship between investment and income is positive while that between investment and interest rate is negative.

The marginal efficiency of capital is the expected yield (or rate of return) on a new capital stock. If we consider the case of capital that would be productive forever (no physical depreciation), the yield on capital (MEC) will equal the returns from capital (P) divided by the cost of capital (P_K)

$$MEC = \frac{P}{P_K}$$

P_K is expected to rise as the capital stock rises since investors will bid up the price of capital. The return (P) will fall because a declining marginal product of capital will make each unit of capital added less productive. This implies that there is a negative relationship between MEC and the quantity of capital. It is assumed that producer will expand their capital stock until the MEC is equal to market interest rate. Therefore, if there is equilibrium, the MEC schedule also shows the relationship between the market interest rate and the quantity of capital demanded by investors (fig 4.3a).

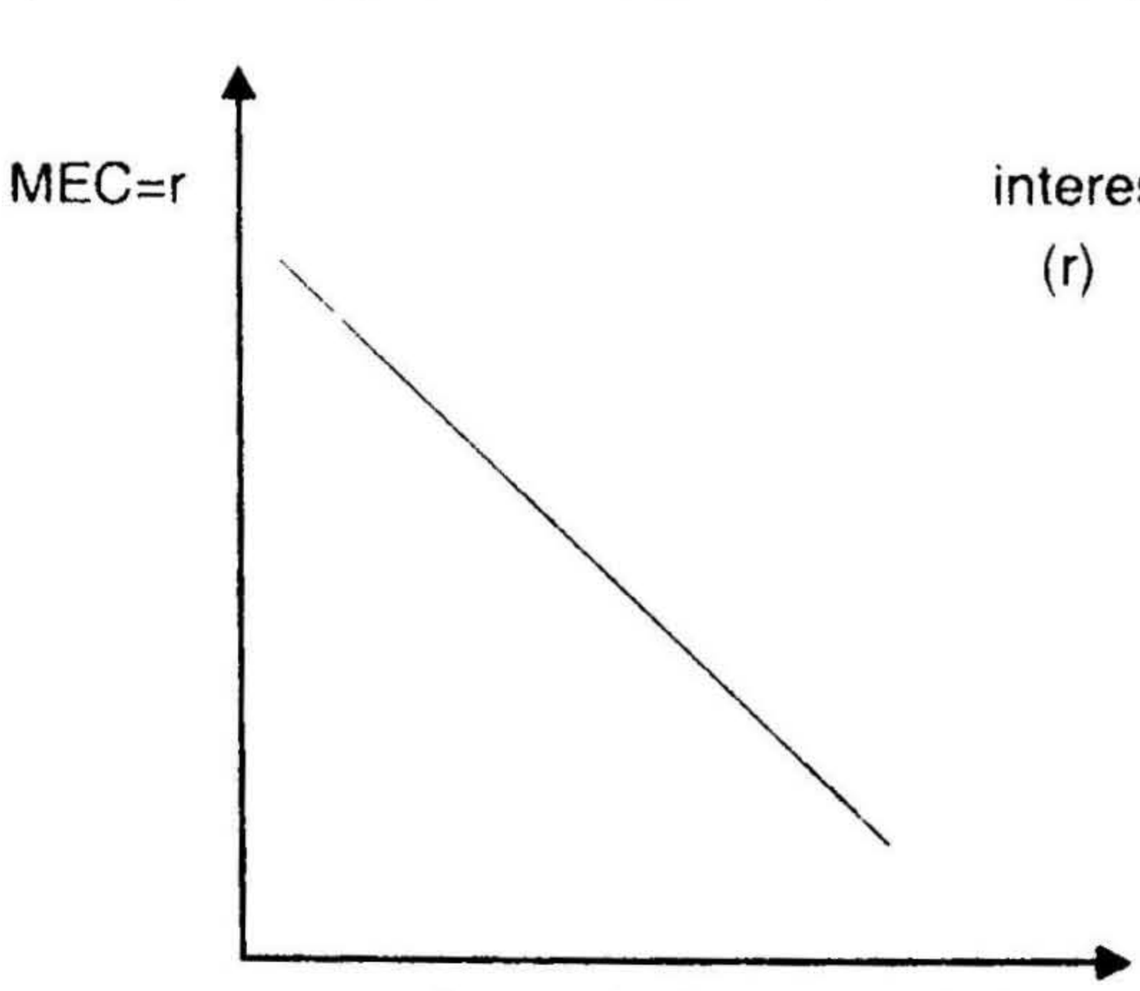


Fig 4.3 (a): MEC

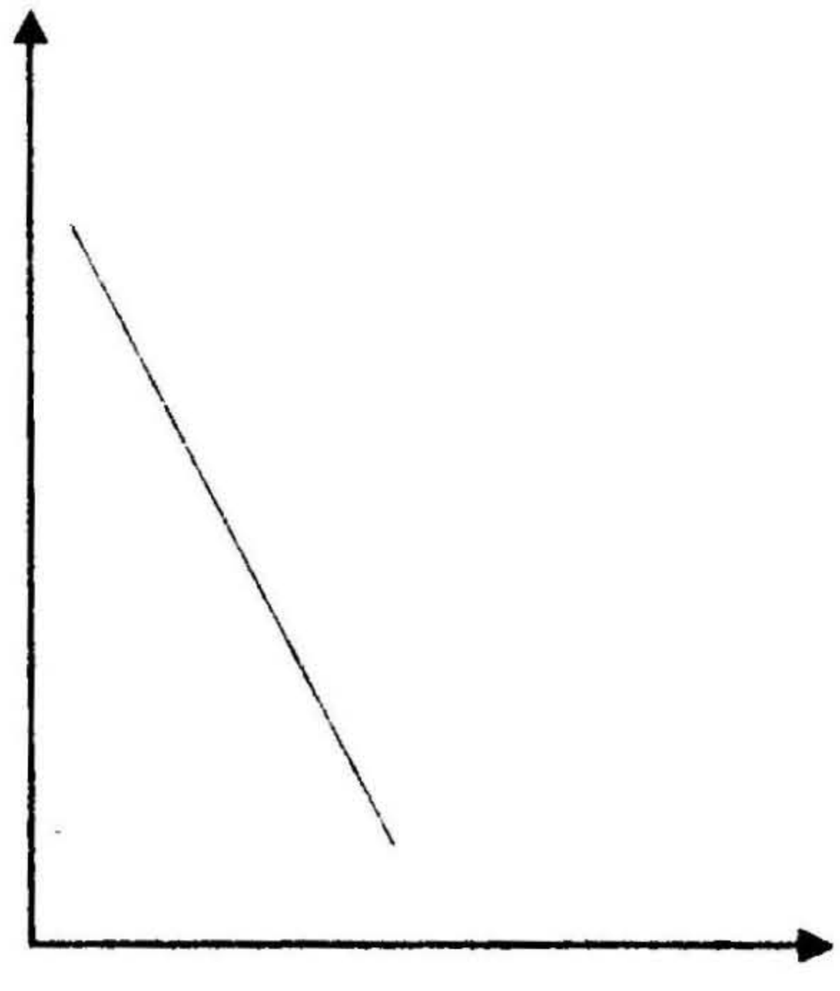


Fig 4.3 (b): Investment schedule

It is important to understand that MEC schedule and investment schedules are not

the same thing. There is subtle difference. The MEC schedule shows the relationship between the rate of return on capital (equal to the interest rate in equilibrium) and the amount of new capital demanded (ΔK). The investment schedule shows the relationship between the interest rate and the value of new capital demanded ($P_K \Delta K$) which is defined as investment. Also it is important to understand that as ΔK rises with lower interest rate, P_K will rise with it and the product of the two, which is investment, will reflect both changes.

Even if capital has a finite life, the results are essentially the same. Instead of using the equation, MEC = P / P_K, to calculate MEC, we would have to use a discounting formula:

$$P_K = \sum_{i=1}^{t} \frac{Pi}{(1+MEC)\, i}$$

In this equation, which would have to be solved for MEC, t represents the numbers of years in the life of the capital assets and Pi represents the expected returns in each year. In this formula, MEC will still fall as Pi drops with a larger capital stock.

Concept of Multiplier

The essence of multiplier is that total increase in income, output or employment is manifold the original increase in investment, income or employment. For example, if investment equals to Rs. 100 crores is made, then national income will rise by a multiple of it, say Rs 300 crores. Then multiplier is equal to 3 in this case.

$$K = \frac{\Delta Y}{\Delta I}$$

Where, ' K' stands for multiplier, ΔY for increment in income and ΔI for increment in investment.

$$\frac{\Delta Y}{\Delta I} = \frac{1}{1 - MPC}$$

Therefore, $$K = \frac{1}{1 - MPC}$$

$$= \frac{1}{MPS} \quad \text{(since MPC + MPS =1)}$$

Where, MPC is marginal propensity to consume and MPS is marginal propensity to save.

This equation is got by a series of geometric progression assuming that the MPC of the people are the same.

Example: If MPC of a community =2/3

$$\text{Then, } K = \frac{1}{1 - 2/3}$$

$$= 3$$

Assumptions:

Many significant assumptions are made in order to arrive at the equations of multiplier.

1. The MPC remains constant throughout as the income increases.
2. There is net increase in investment over the preceding year and no further indirect effects on investment occur.
3. There is no time lag between the increase in investment and the resultant increase in income.
4. Excess capacity exists in the consumer goods industries so that when the demand for them increases more amounts of consumer goods can be produced to meet this demand.
5. Imports and exports are not taken into account. A part of increment in consumption expenditure would have been done on imports of goods from abroad. This would have caused increment in income in foreign countries rather than within the country. This will reduce the value of multiplier.

In fig 4.4, C is marginal propensity to consume. C+I is the aggregate demand curve. OY_1 is the level of income. If the investment increases by EH, the aggregate demand curve shifts to the new position C+I'. Here the level of income increases to OY_2. It is seen from the figure that ΔY (increment in income) is greater than ΔI (increment in investment). On the other hand $\Delta Y = 2\Delta I$, therefore multiplier = 2

Diagramatic representation:

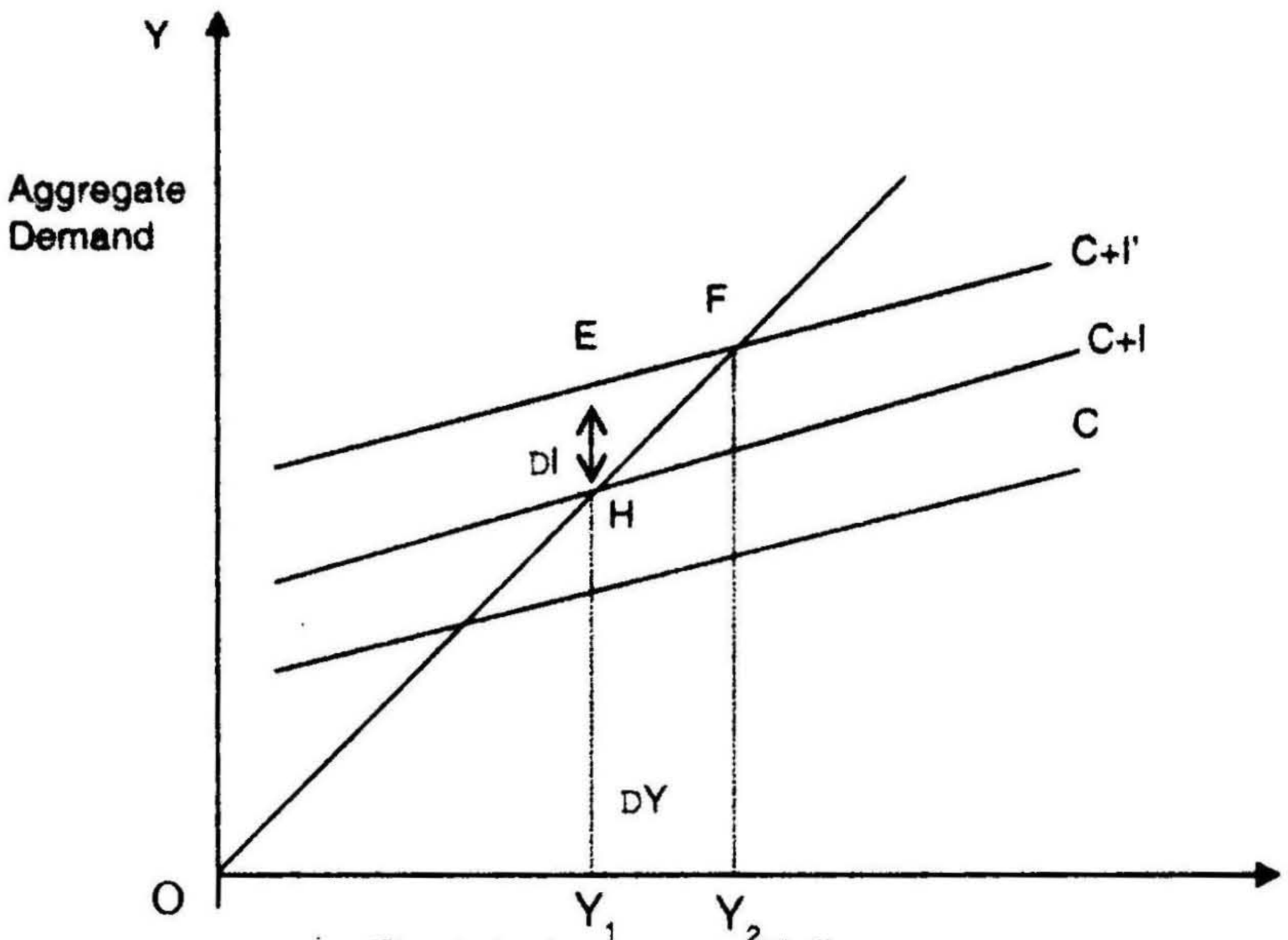


Fig 4.4 : income multiplier

Leakages in multiplier process:

1. **Paying off debts:** A part of the increment in income is used for paying back the debts, which people may have taken from moneylender, bank or other financial institution. Therefore, this part of the income leaks away from the income stream. This reduces the size of the multiplier.

2. **Holding of idle cash balance:** Some people keep part of their money for satisfying their precautionary and speculative motives. Money kept for such purpose is not consumed.

3. **Imports:** A part of increment in income will also be spent on the imports of consumers' goods. This will generate income in other countries and will not help in increasing income and output in the domestic economy.

4. **Taxation:** The increment in income is used for payment of taxes hence the multiplier is reduced.

5. **Increase in prices:** The multiplier works in real terms only when, as a result of increase in income and aggregate demand, output of consumer goods is also

increased. When output of consumer goods cannot be easily increased, a part of the increase in the money income and aggregate demand raises prices of the goods rather than their output. Therefore, the multiplier is reduced to the extent of price inflation.

Concept of Accelerator

The accelerator measures the effect of an increment (or decrement) in the rate of consumption on the volume of investment. Investment demand is derived from the change in output demanded. According to Paul Samuelson, the level of investment is a function of the change in consumer demand.

$$n = \frac{DK}{DC}$$

n is a positive constant known as accelerator coefficient. DK is change in capital and DC is change in consumption.

Since $I = DK$

$$n = \frac{I}{DC}$$

If the consumer's demand rises in the early expansion at a rising pace, then investment rises rapidly. If, however, the growth of consumer's demand merely slows down, then investment will begin to decline. This happens because investment is a function of change in consumer's demand, not its level. If consumer demand remains at a high level, but does not change, then investment will be zero.

The machine making (or investment) industries in the ultimate analysis depends on the consumption goods industries, or the consumer goods industries constitute the basis of the investment goods industries. The accelerator simply measures the changes in the consumption goods industries.

Assuming that an expenditure of Rs. 5 crores on consumption goods industries leads to an investment of Rs. 10 crores in investment goods industries, we can say that the accelerator is 2. If the production of consumption goods involves no investment then the accelerator is 0. But generally the productions of consumption goods involve some amount of capital equipment. Hence the accelerator is generally more than unity.

Defects in accelerator:

1. The investment responds to change in demand and exhibits a changing time lag over the cycle, so no fix time lag is there.
2. n changes over the cycle because of change in expectations.
3. Accelerator is lower in recovery because of unused capacity.
4. Limited by capacity of capital goods industries.
5. In trough, disinvestment is limited by amount of depreciation.
6. The investment function leaves out other variables other than aggregate demand. It omits changes in the cost of labour, machine and raw material.
7. Treats monopoly and competitive sectors the same.
8. Omits specific consideration of government and international demand.

In spite of all these, the accelerator has been used in many cycle models because it represents a powerful truth in addition to allowing for rather simple mathematics.

Inflation

Inflation is defined as a persistent and appreciable rise in the general level of prices. It is a process of rising prices and not a situation of high prices. It should be clearly understood that if the general level of prices suddenly rises and stays at that level it is a situation of high prices and not inflation. It means that rapidly rising prices of goods cause a decline in the purchasing power of the currency i.e., the aggregate demand is greater than the aggregate supply leading to price rise. This is a situation in which too much of money is chasing too few goods causing a state of disequilibrium.

Causes of inflation:

1. When an economy tries to grow more rapidly than the required rate of growth. They make huge investment to obtain rapid economic growth. This increases the aggregate demand hence the price of goods increases.
2. When the government absorbs more resources than released by the private sector at the existing price level.
3. When various groups in the economy attempt to improve their respective productivity.
4. When buoyant expectation causes the demand for goods and services to rise more rapidly than the capacity of the economy to expand output.

Types of inflation:

A. Based on casual factors:

1. **Demand-Pull or excess demand inflation:**
   This is caused by a situation whereby the pressure of aggregate demand for goods and services exceeds the available supply of output. Inflation in the developing countries is mainly of demand-pull type.

2. **Cost-push inflation:**
   This happens if cost, particularly the wage costs keep on rising. The employees are agreeable to concede to these wage claims because they hope to pass on these rise in costs to the consumers in the shape of rise in prices.

3. **Mark up inflation:**
   Another factor responsible for inflation is the increase in profit margin by the firms, working under monopolistic or oligopolistic conditions and as a result charging higher prices from the consumers.

4. **Mixed demand-cost inflation:**
   This is the hybrid of the above-mentioned two cases and is most commonly observed.

5. **Bottle neck inflation:**
   In this case the price rise is due to the changes in the structure of demand or hurdles in production or supply. Proper management of demand and supply can check this.

B. Based on Intensity or extent of inflation:

1. **Creeping inflation:**
   This is the situation of slow rise in the prices. The price rise is 2-4% per annum:

2. **Running inflation:**
   The price rise is out of control and requires corrective measures by the Government. The price rise is 5-10% per annum.

3. **Galloping or hyper inflation:**
   The price rise is extremely high creating high tension for the Government and needs immediate corrective measures. The price rise is above 10% per annum.

C. Based on degree of Public or Govt. Intervention:

1. **Open Inflation:**
   The price rises are not controlled by any Government agency. This may finally lead to hyperinflation.

2. **Suspended Inflation:**
   The price rise is checked by control measures by the Government. In this case the causes or the factors causing the inflation are not controlled but the prices are controlled. So, once the control releases, price start to rise again as inflation cannot be suppressed for a long time and then turns into an open inflation which is much more harmful as it causes administrative problems in the Government.

Effects of Inflation

1. **Inflation erodes real income of the people:** Real income implies the amount of goods and services, which you can buy i.e. purchasing power of your income. If the income increases at a lower rate than rate of rise in general price level, your real income will decline.

2. **Creditors and debtors:** Harm the creditors and benefits debtors. For creditors who inters into agreement with the borrower to provide loan at fixed nominal rate of interest, the real value of money, which they will receive at the end of the period, will be much less. Thus, the debtors gain, as they would return the loan money when its real value has decline.

3. **Fixed income group:** When inflation occurs the purchasing power of their fixed nominal income falls.

4. **Pensioners:** The real value of the pensions is reduced.

5. **Businessman:** Inflation increases the profits of businessman. The prices of goods produced by entrepreneurs rise relatively faster than the cost of production.

Measures to control inflation:

1. **Fiscal Policy: Reducing budget deficit**
   By greater resource mobilization on the one hand and pruning down of wasteful and unessential government expenditure the budget deficit and consequently deficit financing can be reduced. The government can mobilize more resources through raising taxes, market borrowing and raising small savings. It can reduce budget deficit by curtailing its wasteful expenditure (like expenditure on defence, police,

general administration and subsidies on food, exports, etc.)

2. **Monetary Policy: squeezing credit**
   The most important anti-inflationary measure in India is the use of selective credit controls, meant to control the available of credit in general. The selective credit controls used are

a) Minimum margins for lend by bank.
b) Fixation of maximum limit to individual borrowers.
c) Fixation of minimum rate of interest

3. **Enlarging imports surplus:**
   To correct excess demand relative to aggregate supply, importing goods in short supply can raise the latter. At times of inflationary expectations, there is a tendency on the part of businessmen to hoard goods for speculative purposes. The attempt by the government to import goods in short supply would compel the hoarders to release their hoarded stocks. This will have a favorable impact on price of these goods.

4. **Income policy: freezing wages**
   In this policy, the wage increases, which are unrelated to improvement in productivity, is avoided. This requires exercising control over wage-income. The wage increase should be allowed to the extent of rise in labour productivity only. This will check the net growth in aggregate demand related to aggregate supply of output.

5. **Fuller utilization of productive capacity:**
   If productive capacity in the economy is fully utilized, excess demand can be reduced. This would augment the aggregate supply of output and reduce the gap between aggregate demand and output and will therefore tend to reduce inflation.

CHAPTER V

THEORIES OF FACTORS OF PRODUCTION

Theory of Factor Pricing: "Sharing of Loaf"

Introduction

Factor pricing is an aspect of price theory, which deals with the pricing of the services of the factor of production, or their rewards. E.g., wages (the reward of labour), rent (the reward of pond), interest (reward of capital) and profit (reward of entrepreneur). In this chapter we do not discus the determination of prices of the factor themselves but of their services. It is not the factors, which are being bought and sold but their services.

The factors of production include the land, labour, capital and organisation. The reward for theses factors includes the rent, wage, interest and the profit respectively.

What is distribution?

Ages ago, man lived in caves in jungles. His needs were few and he satisfied them wholly by his own efforts. He ate what he gathered- fruit, root or leaves. There was no joint production and hence the question of distribution did not arise. No doubt there are still a few people in the world who still live in jungles like the Bushman in Australia and in Africa.

Distribution here means the sharing of national dividend among the various factors of production, (i.e., land, labour, capital and organization) which have contributed to the work of production.

An interesting problem

Each one of us is the producer of service, a utility or a good. The problem of distribution is, therefore very interesting for all of us. Every one expects a reward and wants more of it. He thinks he can have only if his neighbour has less of it. Somehow he can come to believe that there is a loaf of bread of a limited size and each one of us can have an extra slice only at the expense of others.

If it was possible to produce enough of all kinds of goods without working, then the economic system will work smoothly. Everything would be free and everyone would be able to have what he wanted, there would be no dispute, no fights. "That would be a true Rama Rajya", you say. Unfortunately no such state of bliss is near. In real world, productive reasons are scarce while population and human wants are increasing. Joint efforts of all factors- human and material or pool of goods called the "national dividend". Out of this pool every contributor get his share. The landlord gets his rent, the laborer his wage, the capitalist his interest and the organizer his profit. Three questions faced here are-

1. What is there to be distributed?
2. Among whom?
3. How is each share to be determined?

National dividend

It is national income or dividend, which is to be distributed. National dividend presupposes something to be divided. That something is the total wealth produced by the combined efforts of the four factors of production. It is, however, essential to maintain the productive capacity of a nation intact.

The size of the national dividend is important for a country in as much as the welfare and prosperity of its people depend on its value.

According to Dr. Marshal, "The labour and capital of a country, acting on its natural resources, produce annually a certain net aggregate of commodities, material and immaterial, including services of all kinds – this is true net annual income or the national dividend".

The people are concerned with its two ways as producer and as consumer. It is the result of their efforts and source of income too. It is thus "the aggregate net product of the sole source of payment for all agents of production".

The process of distribution is clearly illustrated by the following diagram-

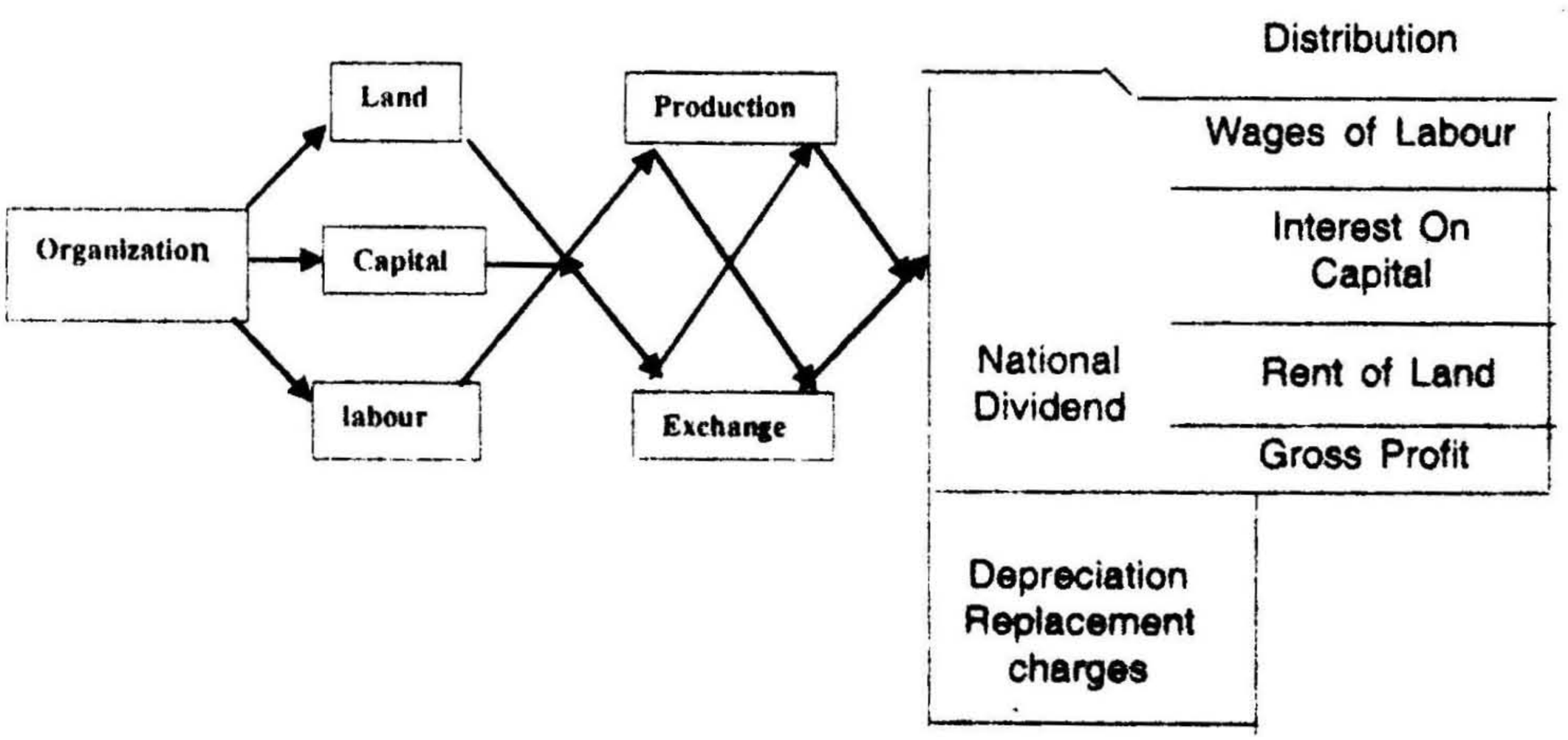


Fig .5.1 The process of distribution

Theory of distribution:

We are now ready to discus this question. How to determine the value of the representative services of labour, land, capital and organization? According to this theory, the key to the pricing factors of production lies in marginal productivity.

Marginal productivity theory:

Marginal productivity is the increment of the total output caused by employing an additional man, the total value of other factors remaining unchanged. That is to say, it is the marginal physical productivity multiplied by the marginal revenue to the unit or group under consideration.

The marginal productivity theory of distribution is an attempt on the part of the economist to evolve a general theory, which will explain the determination of factor prices such as, wages, rent, interest and profits. It serves as the general theory of distribution in terms of which the rewards of all the factors could be explained.

A firm employs a factor of production because of its productivity or the contribution it makes to output. The remuneration or the reward which the firm will be willing to pay the factor in question, that is the price of factor will therefore, depends upon its productivity. The greater the productivity of factor, the higher will be its price (or reward). The marginal productivity theory therefore relates the reward of the factor to the productivity or the contribution, which that factor makes to the total production. The firm will employ deferent units of factor up to the point at which the reward paid to marginal unit of factor (the marginal cost of the factor) is equal to the contribution made by that unit to total output (marginal productivity). The reward of the factor unit at the margin, is, thus, equal to its marginal productivity. The essence of this theory is therefore, is that the price of any factor of production depends upon its marginal productivity

The concept has been primarily developed with reference to the factor of production, labour, but what is true of labour is equally applicable to the other factors, such as, land, capital and organization. Thus the price of labour (or, wages) depends on the marginal productivity of labour or demand side.

To explain how marginal productivity of a factor (e.g. labour) determines its price; we shall make assumptions in regards to labour. Firstly, we assume the existence of perfect competition in the labour market. There is a very large numbers of buyers (firms) and sellers (workers) of labour in the market, resulting in a given; wage rate existing at a particular time. Secondly, we assume that existence of perfect competition in the product market, i.e., in the market of the product, which labour helps to make. Resulting in the establishment of given price for the product at a particular time. Thirdly, we assume that all units of the factor, labour are homogeneous so that all the workers are equally efficient. Fourthly, we assume that labour is the only variable factor and all others are fixed. This will enable us to calculate the marginal productivity of labour in physical terms.

On the basis of these assumptions, let us now consider the marginal physical productivity of a labour for single firm. Suppose the firm produces fish, by increasing the supply as shown in the table-

Table 5.1 Schedule of total and marginal physical productivity

Labour employed	Total product (in Kgs)	Marginal physical productivity (in Kgs).
1	5	5
2	12	7
3	24	12
4	44	20
5	69	25
6	99	30
7	126	27
8	151	25
9	169	18
10	179	10

The marginal physical productivity of labour increases, when additional labours are taken until six labours is employed. When seven labours are employed the MPP begins to decline and continue to decline there after. The total physical product increases at first at an increasing rate and subsequently (after 7th) increasing at a diminishing rate. This change in the rate of increase in total product is due to the fall in the marginal physical productivity of labour. So, as long as marginal physical product (MPP) is on the increase, the total product increased at an increasing rate. The moment the MPP began to decline, the total product increased at a diminishing rate this is in conformity with the law of variable proportions.

The MPP curve takes the shape of an inverted 'U'. It represents the normal shape of MPPC. Till OM numbers of labourer are employed, the MPP increases. Beyond OM, MPP falls.

It is important to note here that the fall in MPP after OM number of labourers is not due to any differences in the level of efficiency of subsequent labourers, but is due to technical conditions of production, which do not permit the continued increase in the number of labourers in conjunction with the other fixed factors.

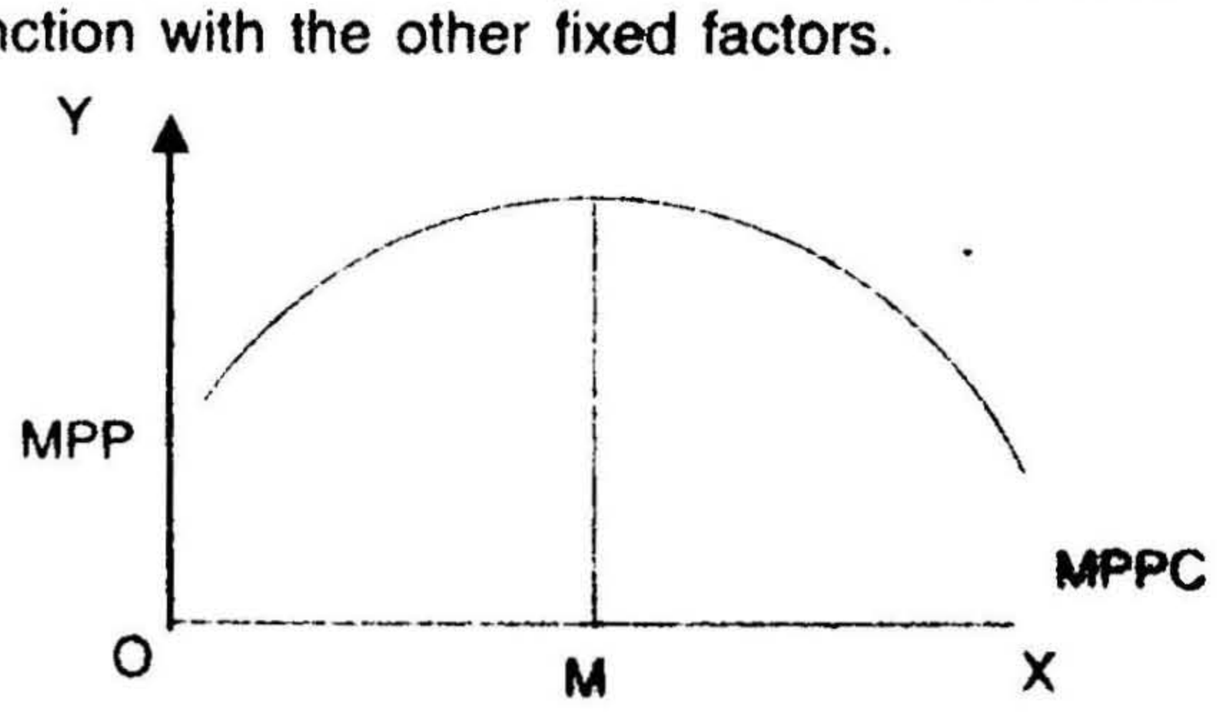


Fig 5.2 Marginal physical product curve

Marginal Revenue Productivity (MRP):

The firm is not interested in knowing how much it can add to its revenue by progressively increasing the size of its labour force, the firm has to compare marginal revenue of labour with its marginal cost, we are interested more in the money value of the MPP of the labour, because after all, the firm has to pay its workers in cash, not in terms of fish.

The concept of MPP, thus leads us on to the concept of MRP, MRP shows additional to those revenue of the firm when its adds successive units of labours to the fixed amount of other factor of production. MRP is more meaningful concept than MPP. MRP can be estimated by multiplying MPP by the price of the commodity in question.

Ex. if price of fish is Rs. 5 then it calculated as,

Table 5.2 Schedule of Marginal Revenue Productivity.

Labour employed	MPP of labour in Kgs.	MRP of labour (MPP x Price) in Rs.
1	5	25
2	7	35
3	12	60
4	20	100
5	25	125
6	30	150
7	27	135
8	25	125
9	18	90
10	10	50

On the basis of above schedule, we can show the trend of the marginal revenue productivity by drawing MRP curve.

The MRP curve, like the MPP curve, is an inverted 'U' It rises at first, but falls subsequently. The rising slope of the MRP curve shows the increase in the marginal revenue product, while the descending slope indicates the decrease in the marginal revenue product.

Like wise, Average Revenue product at any level of employment can be easily known at that level. The relationship between the MRP and ARP curves shows, when marginal revenue exceeds the average revenue, the MRP curve lies above the ARP curve. When the marginal revenue falls below the average revenue, the curve lies below the ARP curve. This indicates the decrease in productivity of the labour. The MRP curve intersects the ARP at latter and highest point.

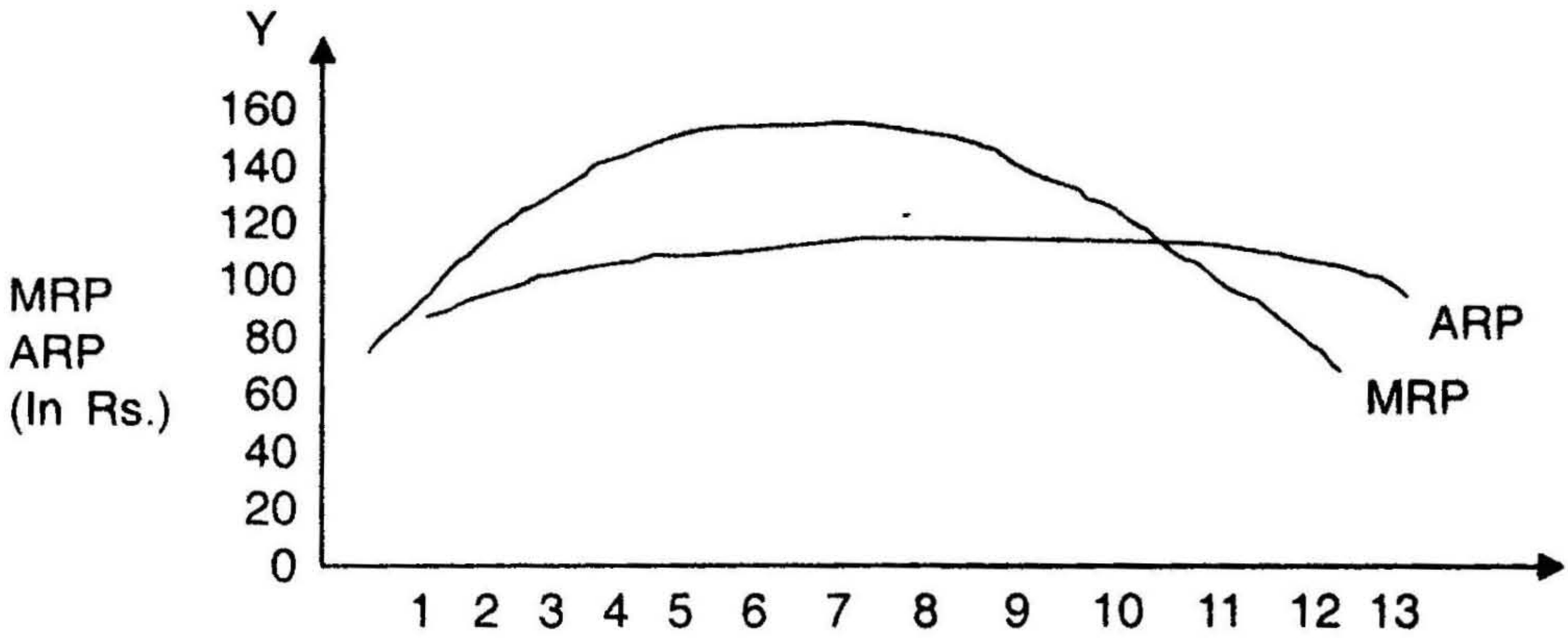


Fig 5.3 Relationship between MRP and ARP

After calculating all, we are interested in Net Average Revenue Product and not Gross Revenue Product. The average net revenue productivity of labour can be found out by dividing the total number of labourers employed. In order to find out the total revenue attributable to labour, we should substract from the total revenue the amount of revenue due to other factors, such as, land, capital and entrepreneurship.

Wages : "The Price Of Human Sweat And Tears"

The various wage- rates and quantities of labour employed are determined by the interplay of the forces of demand and supply in all the product and factor in an economy. It is the demand for goods and services of all kinds which gives rise to the demand for labour and the supply conditions for this factor which determine the wage rates and quantities employed of the various types of labour".

■ **Carter and Snavely, Intermediate Economic Analysis, p. 286**

The term 'wages' has been defined as the price paid for the services rendered in production by labour. It includes all payments (allowances, etc.), which are made to labour.

Or

Any type of reward for human exertion whether paid by hour, day, month or year and paid in cash, kind or both is called wages.

Types of wages

a) **Wages in cash and kind** - Paid as grain, fodder and other commodities, here rise in prices of food grains would not affect the labourer for the worse. This system is bad, as wages in kind are largely governed by custom, which does not allow the standard of living ever to improve. In towns, however wages are paid in cash and are ruled by contract or agreement.

b) **Time wages, piece wages and task wages;**

i) **Time wages**- if a worker is employed at a fixed rate per hour, per day, per week or per month, he is called, as time worker of these 'day' is a more popular.

ii) **Piece wages**- when, however, payment is made according to work done, it is a system of piece wages. This type of work can be easily measured.

iii) Example; manufacture of hockey sticks, cricket bats etc., here quantity is important than quality.

iv) **Task wages-** when the payment is contracted to finish a job we have task wages. Good deal of government work in India is done on contract basis.

c) **Sometimes wages are classified according to the kind of workers employed**

i) **Salaries**-are paid to the higher staff consists of teachers, doctors, directors, engineers etc

ii) **Pay**- is the term used for payments made to clerks, typists, stenographers etc., and they grouped under middle class employees.

iii) **Fees** are paid for consulting people who are independent professions like doctors, lawyers.

iv) **Commission**- Margin allowed to middlemen i.e. brokers etc.

v) **Allowance**- is a special payment made for some special work or for special readings as for traveling, maintenance of cycle, car etc,.

Real wages and nominal wages:

The money paid to a worker, as a reward for his work is known as nominal wages. But, what is money wanted for? Obviously, for the goods and services it can buy. By real wages we can understand the satisfaction that a labourer gets from spending his money wages in the form of necessaries, comforts and luxuries. It me4ans the total benefits, whether in cash or kind, that a worker enjoys by working at a certain job.

Following factors have therefore to be taken in to an account when estimating real wages.

i) Purchasing power of money- money is only a medium of exchange. We value it for its power to buy goods and services.

ii) Possibility of supplementing the income- by private teaching, writing books or articles etc.

iii) Working hours- number of working hours per day will be considered. The days in a week as well as the off days in a year will increase the labours income.

iv) Regularity of employment

v) Nature of job

vi) Future prospects

vii) Expense of starting the trade etc

Why separate theory of wages?

Labourers has certain peculiarities and it is not like any other factors of production, peculiarities mainly, a) the demand for a commodity depends on its utility to the purchaser but the demands for labour depends on not on its utility to the employer but its productivity b) the labour services inseparably tide up with the person who supplies it. c) Institutional and behavior factors exert powerful influence on wage bargains. A sympathetic employ may be more generous towards his labour. d) Labour has weak bargaining power as compared with employer who buys it, hence wages are actually less than they ought to be. e) Labour is perishable.

Theories of wages

Some theories have been advanced to explain the wages.

i) **Iron law of wages or subsistence theory of wages-** wages for enough food clothing and shelter.

ii) **The wages fund theory-** propounded by David Ricardo

He mentioned that a certain fixed proportion of the capital of a country was set apart for payment as wages to labourers. This proportion he called as the wages of fund. According to him wages at any moment were determined by the amount of money in that fund and the total labourers in the country. If the fund remained constant and supply of labour increased wages would fall and vice versa. This theory broke down under criticism, as it could not be discovered how the fund arose and it remained fixed. Besides, it was proved o be historically false. This theory then replaced by Residual Claimant theory.

iii) **Residual claimant theory.**

iv) **The marginal productivity.**

Why do wages differ in different employments?

a) Economic bases for differences.

i) The difference may be due to differing productivity

ii) The efficiency required of a worker varies with occupations and calls for different periods of experiences and training.

b) Demand for labour and its supply are affected by-

i) Agreeableness or disagreeableness of a trade.

ii) Difficulty and cost of learning a trade.

iii) Implements used

iv) Regularity of a job

v) Chances of success

vi) Government regulations

Special cases:

Women labour – is paid less than male labour due to lesser strength, shorter training, not being a permanent worker etc. Sweepers are poorly paid though they do unpleasant job. This is due to additional gifts such as no cost in training, low standard of living etc.

Legal minimum wages: Every government tries to protect workers from sweated labour and tyranny of employers. The best method to do this is to fix minimum wages of workers.

Rent : A Payment, Which Is Not A Cost"

Meaning of rent

In everyday talk rent means the payment made for the use of house, land, a radio or a taxi. It is a hiring charge.

The surplus that remains after all expenses of cultivation have been met is called 'economic rent'. 'Contract rent' is settled by contract between the landlord and tenant. Under conditions of free competition, both tend to be the same. Contract rent refers to the total amount paid by a tenant, where as economic rent is that part of this payment, which is for the use of land only apart from any capital which, may be invested there in.

Gross rent

It includes interest, wages, profitability and economic rent. It is quite clear, therefore that rent of ordinary speech i.e., contract rent is different from economic rent or rent in economic sense. Contract rent includes, interest on capital, wages for management, profitability for the risk rent.

How does rent arise?

Ricardian theory is the classical theory to answer this question. The classical theory of rent is associated with the name of David Ricardo.

As we study natural resources depends on their fertility we divide the land to be of four grades. For convenience, we call them as A, B, C and D in the order of their

fertility. We shall settle down in 'A' part of the land. This most productive land and if pond is made to culture fish, it gives largest produce per hectare. Enough land is available of this quality to satisfy all our needs at the moment. Therefore, it is a free good and not commands any price, i.e., rent. But as the population increases and results in more immigrants towards this land and it changes the structure of rent.

The rent in the extensive form:

In a newly constructed fish farm if given a lease, growers first cultivate the best ponds with increasing demand and these ponds come to enjoy an advantage. This advantage grows large as the margin is pushed down. When cultivation reaches the worst grade pond, all the superior ponds enjoy a surplus. This is rent in extensive cultivation.

Example-

A=12 T/ha	B=10 T/ha
C=8 T/ha	D=5 T/ha

A time comes when all ponds of the best quality have been taken up. But some demand still remains unsatisfied. We have to resort 'B' quality pond now. It is inferior to 'A' and yields only 10 tons per hectare of fish as compare with 12 tons per hectare of 'A' with the same inputs. Naturally pond 'A' acquires a greater value as compared with 'B'. A tenant will be prepared to pay more rent in order to get a pond in 'A' zone, or take 'B' quality pond in free of charge. This difference paid to the owner (if the cultivator is tenant) or kept to him (if he is an owner) is economic rent. In the first case it is contractual rent, in the latter it is known as implicit rent. 'B' zone does not pay any rent. To go a step further, we see that after all pond of 'B'quality has taken up, we begin cultivating 'C' zone. which yields 8 tons per hectare. Now even 'B' quality ponds come to have differential surplus over 'C', rent of 'A' increases further.

When demand increases still more, we are pushed to use the worst pond, which is 'D' quality yielding 5 ton per hectare. 'D' quality pond is now no rent pond or marginal pond, while A, B, and C all earn rent. This growing demand itself shows in rising prices. They rise high enough to cover the expenses of cultivation in the lowest grade pond, i.e., 'D' quality. Let us suppose to take one unit of productive effort is equal to Rs.200, when only 'A' quality pond is used for culture where a production is 10 kgs. and the price of fish Rs. 20 per kg. When due to greater demand the price of fish rises to Rs. 30 per kg, then only 'B' quality pond can be cultivated which produces 8 kgs, of fish. And when that happens 'A' pond will have a surplus of 2 kgs. x Rs. 30 = 60 this becomes rent.

The difference. in other words, between the return from a zone of pond above the marginal pond (i.e., the one just paying its way) is called rent or economic rent.

The rent in intensive cultivation

Putting in more labour and capital in the old ponds can also increase production. The law of diminishing returns applies so that the previous doses of labour and capital enjoy a surplus of produce over marginal doses. This difference too is rent. As more and more units of labour and capital are applied, the return per unit will go on falling

Rent due to difference in situation:

Areas near market and railway stations have to be paid less for transport than others at a distance. This advantage gives them situational rent, which lands at a distance do not enjoy.

No rent or marginal ponds:

The marginal pond is that which it is just worthwhile to cultivate. It is least fertile or worst situated but it is one whose produce is needed for the market.

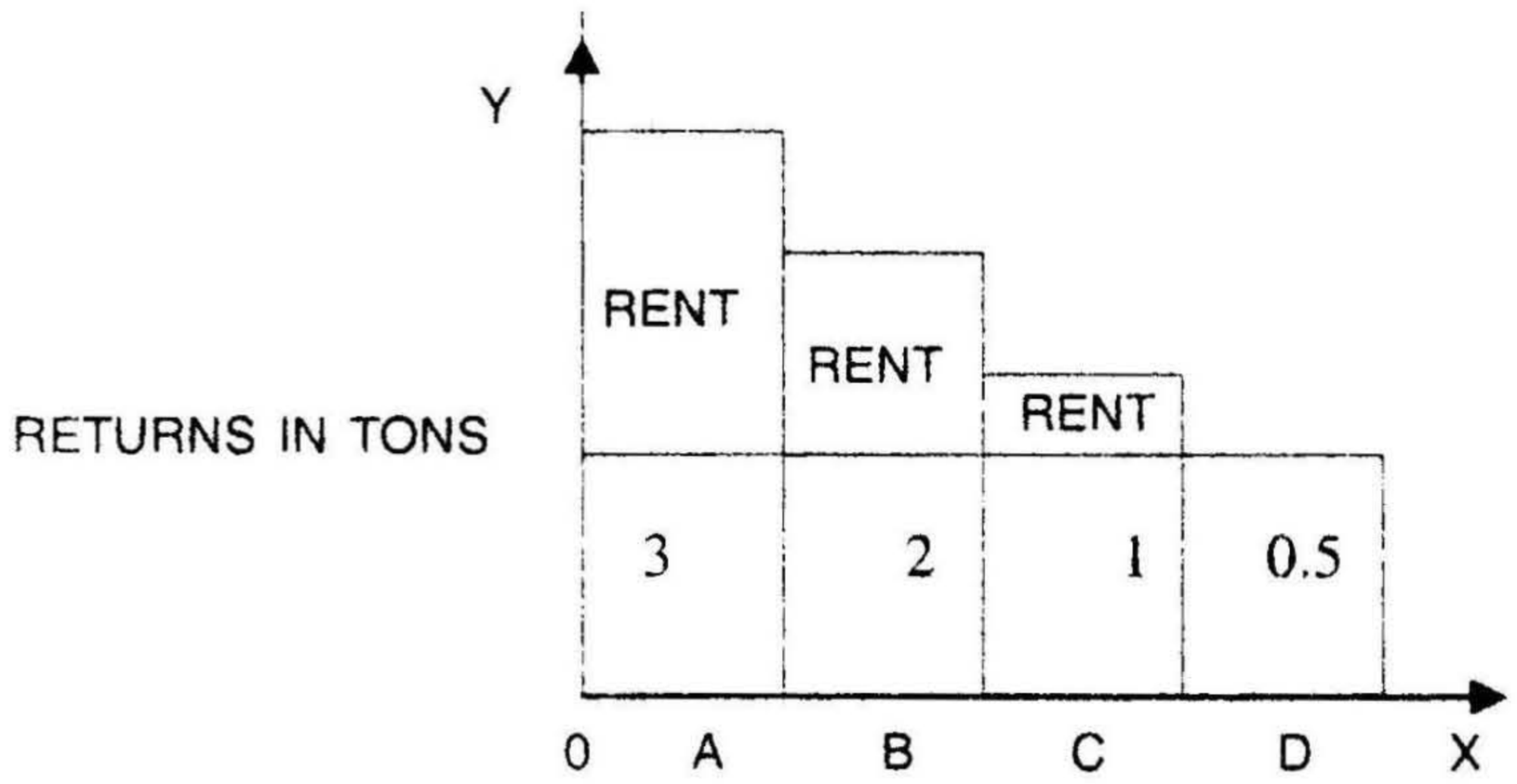


Fig 5.4 no rent or marginal ponds

In this diagram, 'D'quality pond, which produces 0.5 tons per pond, is the marginal land. Here return and cost are equal. It is just worthwhile cultivating this and since it just covers expenses of cultivation and yields no surplus to the cultivator.

It is quite possible we may not be able to discover the 'no rent' ponds because,

a) It may be playing scarcity rent, or

b) The owner might be mistaken for rent, or

c) No rent pond may be in some other country

Scarcity rent – when the entire pond has been brought under the culture and the demand is still unsatisfied, the price of produce rises. Thus all ponds begin to enjoy a

surplus (called security rent) above cost of production.

Rent and prices

Price depends on the cost of cultivation of the marginal ponds, which pay no rent. Thus rent is not a part of price but it itself determined by price. It is not the cause of high price but their result. For example, an argument those pond owners were not to blame for dear shrimp. "Shrimp is not high because a rent is paid but a rent is paid because shrimp is high"

Criticism of Ricardo's Theory of Rent:

Ricardo has summed up in his famous statement that rent is the payment "for the original and indestructible powers of the soil". The two words 'original' and 'indestructible' have come in for much criticism.

1) It is said that no powers are 'original'. Fertility is increased by human efforts and the distance may lose importance through improved means of transportation. But still there is a good deal of original element in the fertility and situation.
2) Nothing they say is indestructible. Fertility can be exhausted by continues use. But Ricardo's theory is not baseless. Fertile pond regains lost fertility more easily.

Non-Aquacluture Rent – Too, is determined on the same principles. In urban localities, situation matters the most. In case of mines, etc., A part of payment is for the exhaustion of their capabilities. This is called Royalty.

Quasi-rent-

A rent that is paid during emergencies or certain circumstances a payment is called quasi-rent. Ships in times of war earn a surplus income due to scarcity till more of them are built. Similarly labour and organization sometimes get extra income, which can be termed as 'quasi-rent'.

Personnel rent-

is the extra income earned by men of superior ability over and above the marginal people in any profession. This is why popular actors earn more than the ordinary ones.

Economic progress and rent-

Increasing population raises rent. Improved transport will raise the rent if a place is connected with a new market and it if it is connected with new source of supply then it will lower rents.

Land revenue and rent

Due to hunger in India both land revenue and actual rents are higher than the economic rent.

Conclusion

Summing up we see that rent is a differential surplus and arises from the facts that land posses certain peculiarities as a factor of production. It is limited in an area and its fertility varies.

i) Fertility more or less fixed by nature. Based on the situation like,

ii) Every pond differs in situation which cannot be changed and

iii) The total stock of pond is fixed which cannot be increased.

According to knowledge gathered by this chapter, the fertility, situation and limited total stock – these qualities, which are original as well as permanent, give rise to rent.

Interest "Money Breeds Money"

Meaning of interest

The payment made to its owner for the use of capital is called interest.

Interest in the past

Interest was condemned for ages immoral. Aristotle was probably the first to raise his voice against it. He said, 'money is barren and can have no legitimate child'.

Those who were forced to barrow for consumption paid interest almost always. That is the reason for its frequent condemnation.

Interest today

i) **Justification of interest**- most of the borrowings today are for production purpose, and are used as capital. Producers gain from the use of capital, so it is not unreasonable if they pay for its use.

ii) **Socialist view of interest-** socialist condemns capitalists as they earns more by giving away the capital and getting more interest without any effort and recommended abolition of interest. But to condemn capitalist is not to condemn capital.

iii) **Regulation of interest**- in many agricultural countries, maximum rates are laid down by law.

Gross interest and net interest:

Distribution may be made between gross interest and net interest. What a man pays to his creditor periodically for the use of capital called interest in everyday speech. But the whole of this payment is not the true price for the use of capital. It contains other elements too. It is better to call this payment as 'gross interest' of this; net interest is not A part. Gross interest is consists of the following items: -

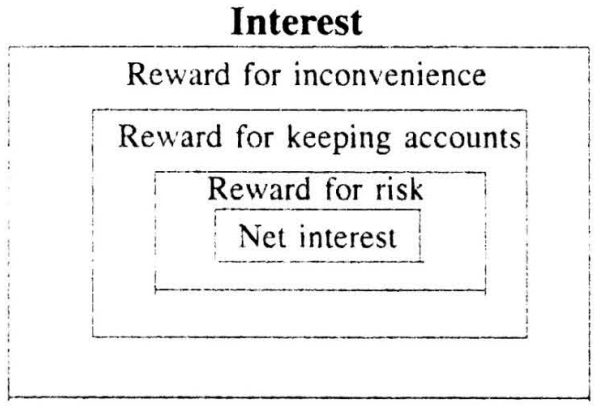
i) **Insurance against risk;** i.e., and element of profit.
Example, securities for capital jewelry, house or land, modern bank too usually demand a security. A part of this payment is insurance against risk.

ii) **Reward for management-** wages for the labour of management and record keeping.

iii) **Payment for inconvenience**
It is higher rate of interest charged when not sure of the interest and principle being repaid in time.

iv) **Net interest-** it is pure interest, after all the above items been deducted from gross interest; what is left is called the payment pure and simple for the use of capital. The money invested in 'gilt edged securities' like government loans or treasury bonds runs very little risk of being lost. Hence the interest paid on such investments does not include much of the other elements. It is the nearest to net interest.

Figure 5.5 : Interest



This distribution between gross and the net interest is very helpful when we find widely different rates of interest being charged in various places and from different persons we know that the differences are in gross interest only. Net interest tends to be the same provided there is perfect mobility of capital; just as it tends to be uniform everywhere when all payments for inconvenience and risks are deducted. The above diagram illustrates the idea clearly.

Theories of interest:

i) There are theories, which explain why interest is paid.

a) Interest is claimed because present satisfaction or liquidity has to be given up for same time in the future. It is also paid because capital is helpful in production which is **productivity theory**

b) **Abstinence or waiting theory:** the sender of capital has to be compensated for abstinence of or for not immediately using his own capital. He has to do the waiting. But some people wait and save even if there is no interest.

c) **The Austrian or Agio theory:** according to this interest is paid to equate the future satisfaction to the present satisfaction, for it is said, "A bird in hand is better than two in the bush".

d) **Fishers' time preference theory:** It says interest is the price for time preference. This time preference depends on the size of man's income, the distribution of income over time, and the degree of certainty regarding its enjoyment in the future and the temperament and character of the individual.

For example, people with larger incomes will be able to satisfy their present wants more fully and will therefore discount future at a lower rate.

ii) How is the rate of interest determined?

Among all theories under this category we may mention,

a) **Classical theory or real theory**: which explains interest by productivity from the demand side and thrift from the supply side.
b) **Loanable funds theory or Neo-classical theory**: which explains interest as determined by the demand for and supply of loanable funds.
c) **Keynes' liquidity preference theory.**

Modern theory

Rate of interest is determined by demanded supply those whom barrow are prepared to pay the marginal productivity of capital. On the supply side, the rate has to be such as to recompense the marginal inventor.

Liquidity theory

According to this theory, rate of interest is a payment of parting with the convenience of holding cash. Give the liquidity preface, more the supply of money, lower the rate of interest and vice-versa. On the other hand, given the supply of money, higher the liquidity preference, higher the rate of interest and lower the liquidity, preference, lower the rate of interest.

Money may be demanded to satisfy number of motives. These are: -

Income motives- we get only periodically; we must keep some money with us till we receive income next.

Business motives- it takes some time before the businessman can sell his product in the market, but he must pay wages to the workers, cost of raw materials, etc., now. He must keep some cash for the future purpose.

Precautionary motives- everyone lies by something for a rainy day. Some money must be kept to meet unforeseen situation and for emergencies.

Selective motive- future is uncertain. Rate of interest in the market continuous changing. No one can guess what turn the change will take. But everybody hopes, and with confidence, that his guess is likely to be correct. It may or may not be so. Some money, therefore, is kept to speculate on this probable.

Effect of economic progress on interest:

Interests tend to decline with economic advancement. Demand for capital keeps on increasing but so do the facilities and willingness to save. The normal surplus of earning over spending expands so that sufficient supply of capital may be forthcoming. But although the rate of interest tends to fall, there is no danger of its falling to zero because saving would begin decline before that.

Profits : "The Race For Riches"

Definition of profits

In economics, the term profit may be defined as the net income of A business after all the other costs- such as rent, wages and interest have been deducted from the total income.

Profits are, uncertain and vary from person to person. They may become zero, when costs are equal to income and if the costs are higher, profits may actually be be converted into loss.

Pure profit

It is the reward of entrepreneurial functions. It is what an entrepreneur gets purely as an entrepreneur. What he gets as landlord, manager or capitalist is deducted from the total profits. Pure profit is an amount, which obtain to the entrepreneur for assuming the risk inseparable from business. It is a reward for assuming the final responsibility, a responsibility that cannot be shifted to anybody else.

Example; Mr. 'x' starts an aquaria, with a capital of Rs. 100000 and all premises belongs to him and his friend works for him without receiving any wages.
The following balance sheet shows income, expenses and profits of the business for one year. Table 5.3 Balance sheet.

Sl. no.	Cash flow	Rs.
1	Total sales	400000
	Cost of goods sold	300000
	Gross profit	100000
2	Expenses:	
	a) Rent (implicit)	9600
	Wages of salesman (implicit)	9600
	b) Interest on owner's capital at 5% (implicit)	20000
	c) Interest on bank loans	5000
	Total	44200
3	Depreciation for soiled goods	8000
	Insurance charges	4000
	Total	12000
4	Mr. 'ex.'s wages of superintendence (implicit)	20000
	Total deductions	76200
5	Net or pure profit	23800

This account shows the nature of profits. The meaning of gross profits too is clear. There are factors for which Mr. 'x' does not pay. They belong to him, but ordinarily they

could not have been obtained without payments. Therefore, these payments, though implicit, must be deducted to find out the net pure profit of the business.

Gross profit: we are now in a position to analyze gross profits. They are the difference between the total sale proceeds and total expenses over a year and include the following besides the net profit;

i) Interest on entrepreneur's capital
ii) Wages of management
iii) Rent of the employer's land and premises Maintenance charges
iv) Net profits

Net profit: If we deduct from gross profits the above items, we shall get pure or net profits. The entrepreneur is entitled the following different kinds of payment, which form a part of his net profit.

i) Reward for risk taking
ii) Reward due to monopolistic position
iii) Reward for better bargaining
iv) Wind falls, i.e., sudden change in market conditions may bring a large gain just by chance

Theories of profits: Several theories have been putforword by way of explanation of profits.

A. Rent theory of profits:

First there is the rent theory of profits propounded by Prof. F. A. Walker of America. According to this theory profits are of the nature of rent. Prof. Walker thinks that just as rent is due to difference in the fertility and situation of the pond similarly profits are the result of difference in ability and place in life of entrepreneurs. Profits are measured upward from the marginal employer who earns no rent land on the margin. Also, just as, rent does not enter into price, profits do not form of price. This theory not wholly accepted. There can be no rent land but get profit in the long run he will join the ranks of salaried employees. Besides, rent does not form a part of price but profits do.

B. Dynamic theory:

This theory is associated with the name of the J. B Clark who is of the opinion that there can be no profit in the static world where size and composition of the population, the number and variety of human tastes and desire, techniques of production, technical knowledge, commercial organizations, etc., remain constant. The profit arise simply because the world is dynamic, changes are constantly taking place. The entrepreneur, who can force changes, can make profit.

Why profits vary?

The main reason for inequality in profits is the differences in ability of entrepreneurs. Ability is mainly God given. i.e., bargaining power, better judgment, organizing skill and so forth.

Socialist view of Profit

Socialists have condemned profits. They say that all wealth produced in the country is the result of the efforts of workers and as such it belongs to labour. The entrepreneur and capitalist serve no useful purpose, they assert. Hence profits and interest mean exploitation and robbery of labour.

Yet no other feature of capitalistic society has been so severely criticized as profits. The losses incurred by the entrepreneurs are forgotten while his occasional large profit pricks the eye.

A more correct line of criticism would be that profits create inequalities and bring power to one class people. Besides the owner is not the only risk bear. The wage earner has to face, equal if not the greater, risks from the uncertainties of business. In a socialistic enterprise, these inequalities and problems are absent. But other difficulties of a different kind present themselves and call for solution in a socialist system too. Profits cannot be abolished, but there is a good case for limitation of dividends.

CHAPTER VI

FACTOR- PRODUCT REALTIONSHIP

Introduction

Resource production economics is a branch of economics, which deals with production in the farming industry. It treats general principles of allocation of land, labor, capital and management inputs, which have scarce amounts of alternative uses, so as to achieve a predefined objective such as profit maximization, satisfying or a combination of both at the micro and macro level.

Aquaculture production economics is concerned with the choice of production patterns and resource use in order to maximize the objective function of the farm operator, their families, the society, or the nation, with in a framework of limited resources. It is concerned with choosing of available alternative or their combinations with a view to maximize the returns and or minimize the costs.

The production economics is concerned with 2 broad categories of decisions in the production process that is:

1) How to organize the resources in order to maximize the production of a single commodity that is to make choice from among various alternative ways of using resources and

2) What combination of different commodities to produce.

With a view to optimize the use of farm resources on an individual farm level and to rationalize the use of agricultural resources from a national angle, production economics involves analysis of relationships and principles of rational decisions.

Objectives

There are many objectives of production economics. The main objectives are

1) Working out the optimum quantities of land, labour, capital, and management inputs for the production of various crops and live stock enterprises.

2) Examining the existing allocation pattern of various aqua cultural practices.

3) Finding out the reasons for the differences, if any, between the existing and optimal levels of resources.

4) Devising appropriate methods for bridging the gaps between the existing and optimum resources use pattern in agricultural production.

Production economics

There is no clear-cut distinction between concepts of production economics and farm management. Production economics lays more stress on the relationship between:

1) Inputs and outputs (factor-product)

2) Input and input (factor-factor)

3) Output and output (product-product)

These relationships are based on maximizing and minimizing conditions. Economics provides few basic principles, laws, and relationships applicable to agricultural production and resource use.

1) **Factor- product relationship**: This relationship is concerned with allocation to optimum production. The choice indicator to be used is price ratio.

2) **Factor-factor relationship**: This relationship is concerned with minimizing cost at a given level of output. The choice indicators are price ratio and substitution.

3) **Product-product relationship**: This relationship is concerned with optimum combination of outputs for a given input level. Price ratio and substitution ratio are used as choice indicators.

The important principles of farm management includes the following

1) **Law of diminishing returns.** Three stage of the law are.
   a) Diminishing marginal returns
   b) Diminishing average returns
   c) Diminishing total returns
2) **The law of equi-marginal returns.**
3) **The law of opportunity cost.**
4) **The law of substitution.**
5) **The law of comparative advantage**
6) **The principles of combining enterprises**
7) **Cost principles**

Table: 6.1.Farm management principles

Principle of economics	Explaining	Management decisions
1) Principle of diminishing returns or increasing costs	Factor-product Relationship	How much to produce? (Optimum levels of resource to use)
2) Principle of substitution or least cost combination of resources	Factor-factor Relationship	How to produce? (Least cost method)
3) Principle of opportunity cost or equip-marginal returns	Product-product Relationship	What to produce? (Enterprise selection)

How to combine inputs:

The use of one variable input (factor) in the production of a given level of fish while other inputs (factors) were held constant has been examined. Now, a study of the use of two variable inputs in the production of a given level of fish must be considered. There are a number of variable input combinations a farmer may use in the production of a given quantity of fish. The fish farmer tries to combine the inputs in such a way as to maintain a constant level of production. The farmer is trying to find the correct combination of inputs that will generate greatest amount of profit. Therefore, the farmer minimizes cost by using the resources that are less expensive and usually most abundant to substitute for more expensive resources. In general this is called factor-factor substitution. This is also referred to as least cost principle. The resources used in the production of a product may be divided into two categories. One category includes those resources required to produce the product, but which remain constant and are independent of the level of use of other resources. A second category includes regional inputs, which vary with output, but may be substitutable within some range with another input. Both types may vary with output; the first in direct proportion, the latter in variable proportion. For example, it has been shown that bone meal may be substituted for feather meal and coconut oil meal may be substituted for soybean meal to a certain level in the production of feed concentrate.

Species such as tilapia have the ability to feed on plankton, but also feed on bottom materials (detritus). They also may be produced using artificial feed. Therefore, farm managers have produced tilapia by combining organic fertilizer and artificial feed. In areas such as United States where artificial feed is relatively abundant, farmers rely heavily on feed. In developing countries where artificial feed is expensive, farmers increase the use of manure and compost in tilapia production.

The factor-factor model answers the question of how much of two inputs, X_1 and X_2, should be combined to produce a given level of output so that the objective of cost minimization (maximum economic efficiency) might be realized. Every input combination will have a unique technical efficiency (rate of gain and costs). A manager, or a fish

farmer, must evaluate the many possibilities to find the one giving the greatest profit.

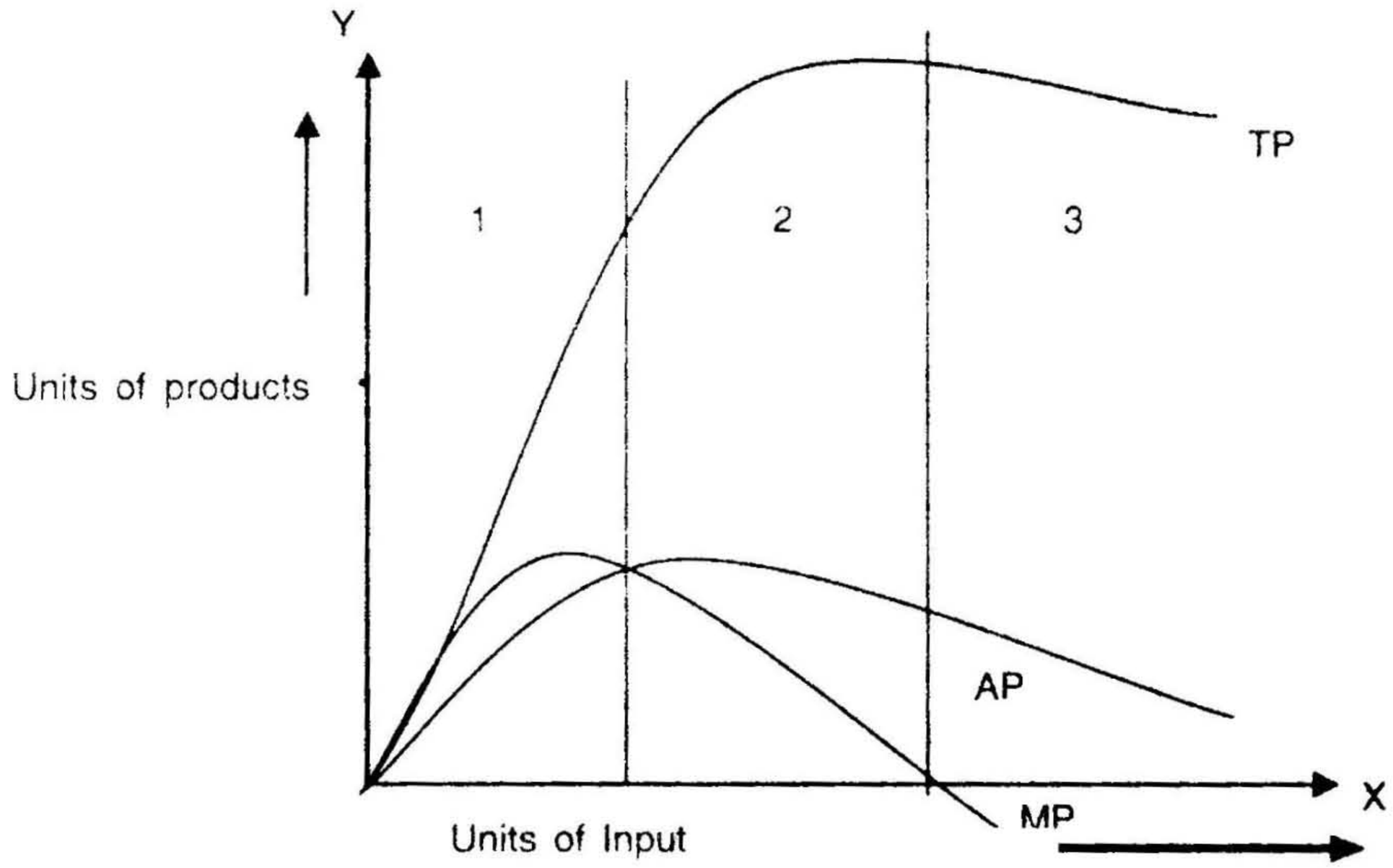


Figure: 6.1 Three stages of production

Factor-Product Relationship

Two types of factor-product relationship in a production function are there.

1) **Proportionality relationship**: in this relationship, some input are fixed while quantities of other inputs vary showing short-run relationship.

2) **Scale relationship**: All the inputs are variable; none is fixed showing long-run relationship

Proportionality relationship

The physical input-output relationship with a variable input with fixed input is shown below.

a) Marginal cost/added cost = marginal return

b) Marginal value product = marginal cost

a). Px .dx =Py.dy viewed from the standpoint of output

b). Py.dy =Px.dx, viewed from the standpoint of input

i.e. a) Px \ Py = dy \ dx

b) dy \ dx = Px \ Py

i.e. price of input (Px)\ marginal product (dy\dx) = price of product

2) **Scale relationship**

Under this we assume that all the inputs are variable and none is fixed. All the inputs land, labor, capital and management which go into production are increased in the same proportion, and we have returns to scale, as against returns under variable proportions when some inputs are fixed in amount.

- Increasing returns to scale
- Constant returns to scale
- Decreasing returns to scale

Increasing returns to scale:

When the inputs are tripled, if it results in increase in returns, which is more than proportional to the outlay on the homogenous inputs, and returns to scale are increasing.

This type of relationship is very short in agriculture and aquaculture. We may have law of increasing returns for a time when additions of labour and capital may yield a more than proportionate increase in produce. It may happen when new technology or some other new discovery makes land more fertile and productive. A stock Pond when well manages may yield increasing returns. But soon after, the law of diminishing returns reasserts itself

Constant returns to scale:

In this, by doubling all the inputs, the output is doubled and hence the increase in the amount of output is proportional to the increase in the amount of input. The production function is said to be linearly homogenous. A function is said to be homogenous of degree 'r' (where $r = b_1+b_2+.....+b_n$) if after multiplying each of its independent variables by constant 'k', the value of the function is altered by the proportion k^1 i.e.

$$F\ (kx_1+kx_2+.....+kx_n)= k^1f\ (x_1+x_2+.....+x_n)$$

If r = 1, then the function becomes homogenous of degree 1,then the Cobb-Douglas production function is linear and homogenous or the first degree, giving constant returns to scale. This law is not strictly applicable to agriculture because the intensification of input per hectare rules out equal addition to the total output.

Decreasing returns to scale

In this the change in input in equal proportion lead to the phases of decreasing returns to scale; soon the increase in output is less than proportional to the increase in aggregate input and returns to scale are decreasing. This arises when farm size becomes

unmanageable. When output increases by using more doses of the variable input to fixed resource, the proportion between the variable inputs and fixed input is changed. As such this law is the law of Diminishing Returns. The law of diminishing returns is a powerful physical law that has its origin in scarcity. Broadly speaking, the law is a generalization based on experience, that the use of increased inputs leads to less than proportionate increase in output.

"An increase in the capital and labour employed in the cultivation of land causes, in general, a less than proportionate increase in the amount of produce raised unless it happens to coincide with an improvement in the art of farming."[Marshall]

"The law of diminishing returns, as is usually formulated, states that with fixed amount of any factor of production, successive increases in the amount of other factors will, after a point, yield a diminishing increment of output. [J. Robinson].

Scope of the law of diminishing returns

It is of basic importance to the farmer in decision-making on:

1. The level of application of fertilizer, the stocking density, percentage body weight of feed etc.
2. The proportioning of inputs to choose in production.
3. The area to operate efficiently.
4. Fixing prices.
5. When the law is in operation in the production of those products whose demand is elastic, the law limits the volume of output.

Limitation of the law

1. It is a technical law relating to physical relationship between one variable input and output.
2. It comes into operation *after a certain stage* has been reached.
3. If the units of labour and capital applied to land are so meager that the land resource is not properly utilized, the law does not operate.
4. If the units of factors of production in the initial stage are inefficient and later efficient units are employed, the law does not come into picture.
5. As pointed by Marshall, the law operates in a static condition. With the use of modern technology, the law is held back.
6. The law has nothing to do with profits.

The phase of increasing returns is associated with decreasing costs and the tendency of decreasing returns with increasing. It may be noted that the law of diminishing returns is not concerned with profit as it is related to physical product only. Similarly, the law of increasing cost has nothing to do with profit.

Table: 6.2 Units of Input (X_1) and corresponding Total average and Marginal Products (X_2 fixed)

Units of (X_1)	Total product (Y)	Average product	Marginal product
(1)	(2)	(3)	(4)
0	0	-	-
1	8	8	8
2	24	12	16
3	42	14	18
4	52	13	10
5	60	12	8
6	66	11	6
7	70	10	4
8	72	9	2
9	72	8	0
10	70	7	-2

$$\text{AP (average product)} = \frac{Y}{X}$$

$$\text{MP (marginal product)} = \frac{DY}{DX}$$

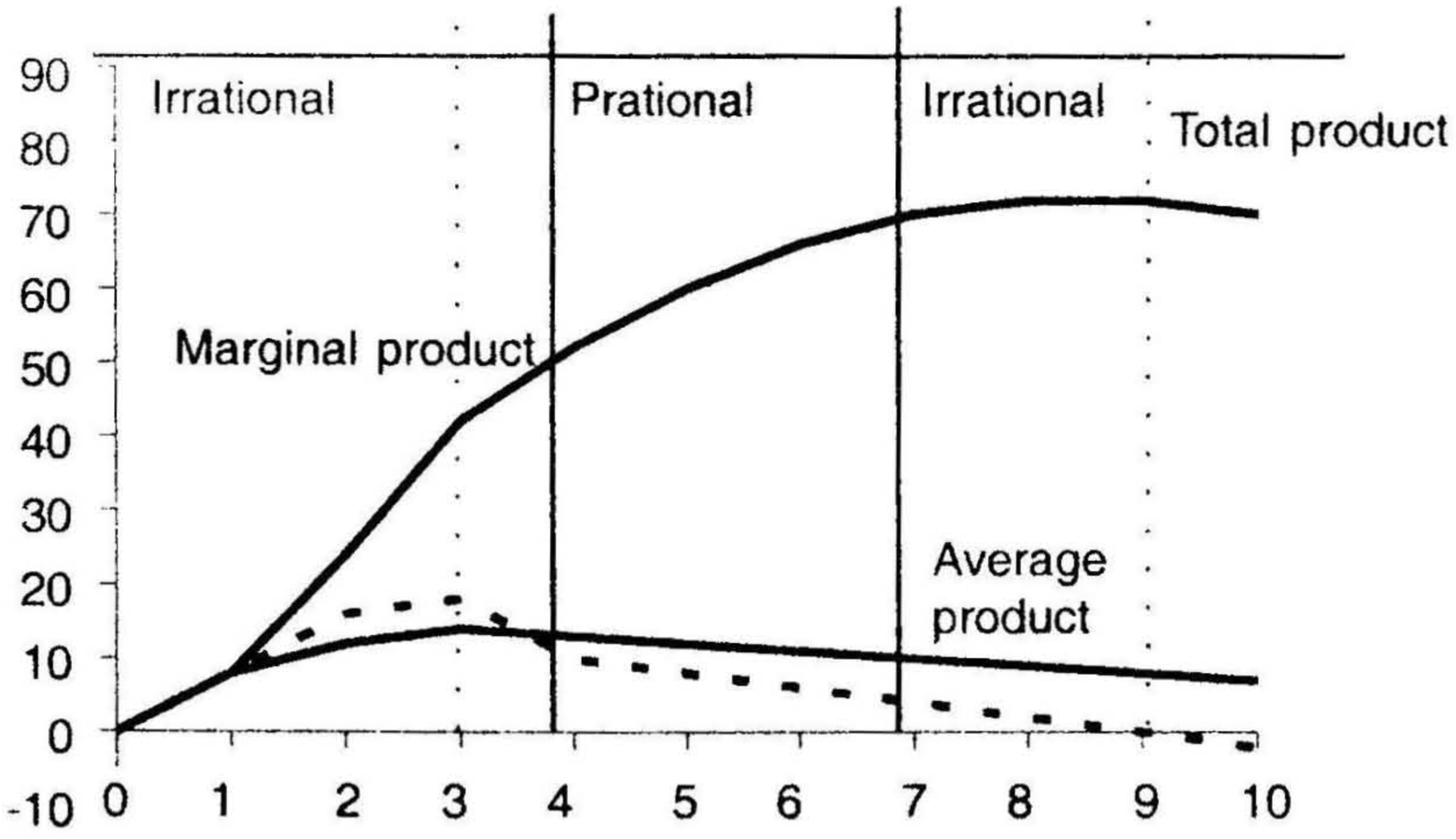


Figure: 6.2 Input-output relationships: stages of production.

Demarcation of the three stages

- Stage I: It extends from the origin to the point where AP is maximized and MP=AP.At this point, MP curve crosses AP curve demarcating the boundary of Stage I.
- Stage II: It extends from the point where AP is maximum to the where MP becomes zero. The boundary of this stage is at the points of maximum TP and Zero MP.
- Stage III: It extends beyond the point of zero M.P. In this stage MP. Is less than zero and TP is decreasing. It is the stage of negative MP.

Table: 6.3. Properties of the TP, MP and AP under each of the Three Stages

Total product (TP)	Marginal product (MP	Average product (AP)
Stage I		
It increase first at an increasing rate and then at a decreasing rate	It also increase to maximum and then begins to decrease	It increases.
Stage II		
It continues to increase at a decreasing rate. After reaching maximum it begins to decrease.	It continues to decrease till it reaches zero	It increases to maximum and then beings to decrease and continues diminishing
Stage III		
It continues decreasing	It is negative	It continues to decrease

Rational and Irrational stages of Production

Stage I and III: Irrational stages

Stage I: In this stage, AP and MP are increasing, but MP is always greater than AP. Hence more units of input increase production in greater proportion.

Stage III: In this stage, total production is decreasing and MP is less than zero. Hence, one gets less and less product for increasing amounts of input.

Do Fish Farmers Ever Operate in These stages?

Sometimes poverty or ignorance of farmers leads them to make irrational decisions. For example, in the production of Rohu or Catla insufficient quantity of fertilizers is used by some poor farmers to reach stage II. Evidence of production in Stage III is with those farmers who use excessive canal water thinking that the canal dues are fixed irrespective of the quantity used. The result is that many a farmer has come to grief due to the conversion of his farm into user (alkaline) patches.

Stage II: Rational stage

Stage II is the relevant stage of production, because the MP, though decreasing is not negative. However, the physical relationships alone cannot determine the level of production in this stage for profit maximization. The introduction of product price and input cost puts the economic issue into proper perspective. Therefore, the necessary condition of profit maximization is where, the optimum input is OX, whose value of MP equals its price

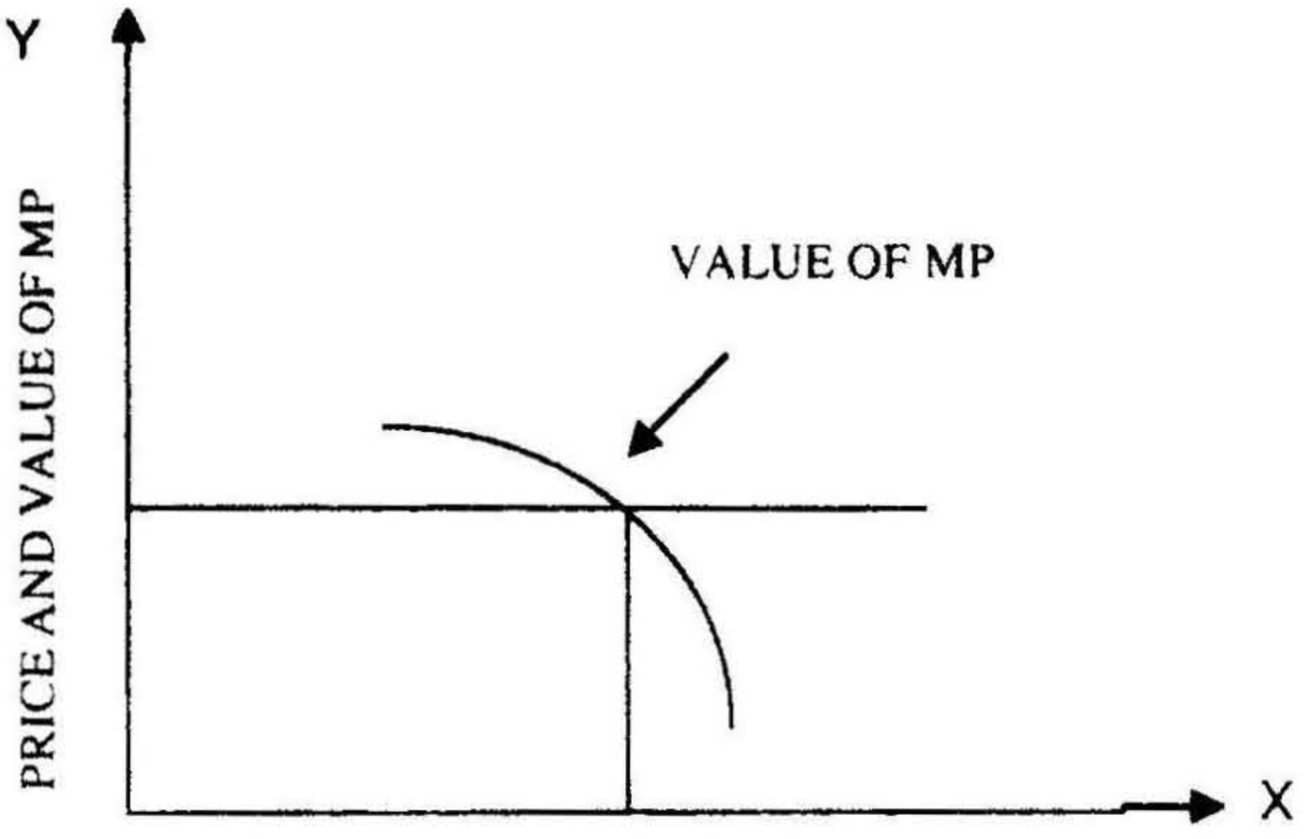


Figure: 6.3. Units Of Input.

Fixed input X

Output what able these Stages when related to fixed resources; Stage III becomes Stage I and Stage I is shifted to Stage III for these inputs. MP's of both types of inputs are positive in Stage II.

In algebraic form

How much to produce under the law of diminishing returns

Stage I	$\frac{DY}{DX} > \frac{Px}{Py}$	Produce more by using more units of input for profit maximization
Stage II	$\frac{DY}{DX} > \frac{Px}{Py}$	Optimum level of input use for profit maximization
Stage I	$\frac{DY}{DX} > \frac{Px}{Py}$	There is over use of input. Hence, it is necessary to reduce certain units of the input for profit maximization.

Elasticity of Production (E_p)

Elasticity of production is measure of the responsiveness of production with a minor change input. It is computed as:

$$Ep = \frac{\% \text{ D in output (Y)}}{\% \text{ D in output (X)}}$$

Since % is common

$$E_p = \frac{DY}{DX} \quad \text{Or} \quad \frac{DY}{Y \,.\, DX}$$

Where,

E_p = elasticity of production

Y = out put

X = input

Expressed in another way

By definition, Y/X = AP and DY/DX = MP

E_p = MP/AP

E.g., 8/6 = 1.33

Example:

Let the application of 4 units of input (land in hectares) give rise to 50 units of output of carp. If 2 units increase the input, the output increases by 10 units; the relative change in input is 2/4=50% and the relative change in output in 10/50 = 20%. Therefore,

Elasticity of Production is 20/50 = 0.4

How does E_p behave in each of the three stages of production? E_p is greater than 1 in stage I; less tan I, but greater than 0 in stage II; and negative in stage III of the production function.

Cost of input X and the extent to its profitable application

The figure has two scales, one for rupee and the other for output. Stage II as shown in the figure is of practical importance within which adjustments are made in the application of input as a result of change in prices. The most profitable combination of inputs is made in this stage. The optimum amount of input X to be employed is at the point where MVP = MC of X.

CHAPTER VII
FACTOR-FACTOR RELATIONSHIP

Introduction

In factor-factor relationship, the combination of two or more than two inputs for a given level of output with the objective of minimizing the cost is taken care off.

For cost minimization at a given level of output, two ratios are needed to compute.

1) Marginal rate of technical substitution ratio of input (MRTS).

2) Price ratio of inputs

The law of substitution is the farm management principles, which founds applicability in the case of the factor- factor relationship. The law of substitution basically relies on the principle that there exists an innate tendency that the farmer operates through the whole field of economics in production, exchange and consumption-is to replace the less efficient by the more efficient agent.

The law states:

"When more than one means of producing a given result is known and available, the least costly will be selected".

It is the operation of this law that when the wages of labourers go high labour is replaced by capital (DL/DC) to a certain extent. Rather to pay high wages to feeding the fish, farmers, for example, tend to substitute labourers by automatic demand feeders. In the same manner replacement of capital by labour (DC/DL) is effective if the cost of machine is very high.

Marginal rate of substitution means the amount by which one input is decreased as input of other factor is increased by one unit.

Two inputs and one output: For a given level of output, the two variable inputs should be combined in such proportions that the ratio of their marginal physical product is equal to the (inverse) ratio of their prices. This is the principle of least cost combination

$$dx_1 / dx_2 = Px_2 / Px_1$$

Where,

X = input,

P = price of the input

Least –cost combination of inputs contributes to profit maximization.

Isoquants:

Iso means equal. An isoquant is another expression of an Iso-product curve, which represents different combinations of two inputs used in the production of a given amount of output.

Properties of isoquants:

1) They slope downward to the right, because if more of one input is used, less of another input will be employed at the given level of output-Input.

Isoquant:

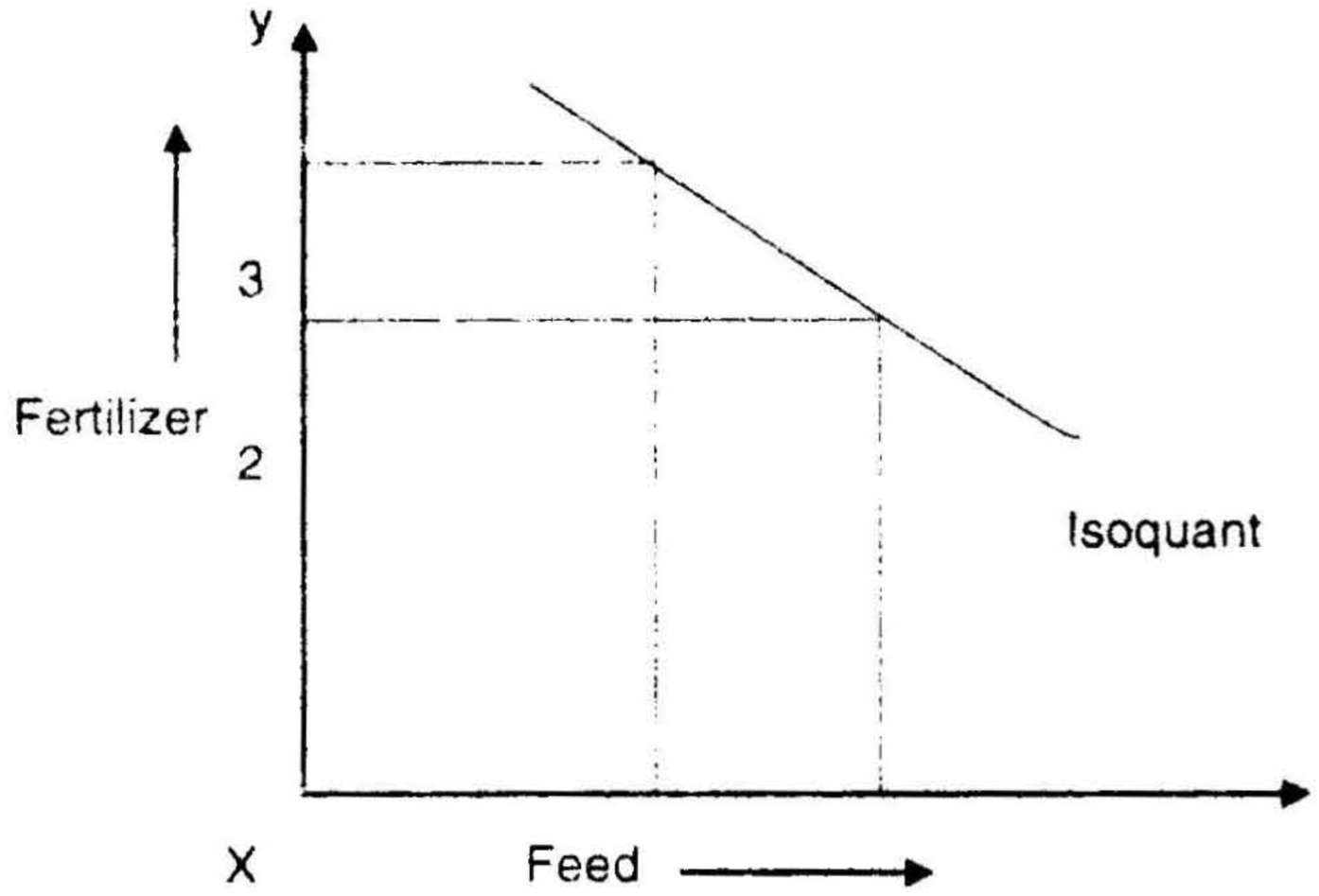


Figure: 7.1 —Isoquant

2) Isoquant does not intersect. It is impossible to have two different outputs from a single combination of inputs.

The isoquant curve illustrates the possible combination of inputs that will yield a given amount of output. The isoquant has a negative slope, which reflects a diminishing marginal rate of substitution (MRTS). The marginal rate of technical substitution (MRTS) refers to the amount of a resource that may be decreased as use of another resource is increased by one unit without affecting output. Algebraically stated:

$$\text{MRTS } X_2 \text{ for } X_1 = DX_1 \backslash DX_2$$

A diminishing MRTS is apparent when successive equal units of a variable input (X_2) are substituted for another variable input (X_1) and the successive equal units of the substitute (X_2) gradually replace less and less of the original value of input (X_1).

MRTS is related to the marginal products of the two inputs. If two inputs, X_1 representing units of

Feed quantity (feeding rate), and X_2 representing protein quality, are used in the production of a given

Quantity of tilapia, the marginal productivity (MP) of feed quantity will be higher as more protein quality is used in production. This will be so up to a point where the MP for feed will decline. The same is true for feeding rate. The movement along the isoquant is represented by dQ, which is equal to 0. This is so since output does not increase when moving along the isoquant. MRTS at a point on an isoquant is, therefore, equal to the ratio of the MPs of the inputs. In this case, the MRTS of feeding rate for protein quality

in the production of a given quantity of fish is the marginal product of protein quality divided by the marginal product of feed (feeding rate).

Shape of isoquants:

The shapes of isoquant for different quantities of inputs upon the substitutability of two inputs are

1) Convex isoquant: here, inputs are good substitutes. For example, two fertilizers of different brands but with identical contents are fully substitutable
2) Straight-line isoquant: here inputs are perfect substitutes.
3) Right angle isoquant: here inputs are used in fixed ratio.

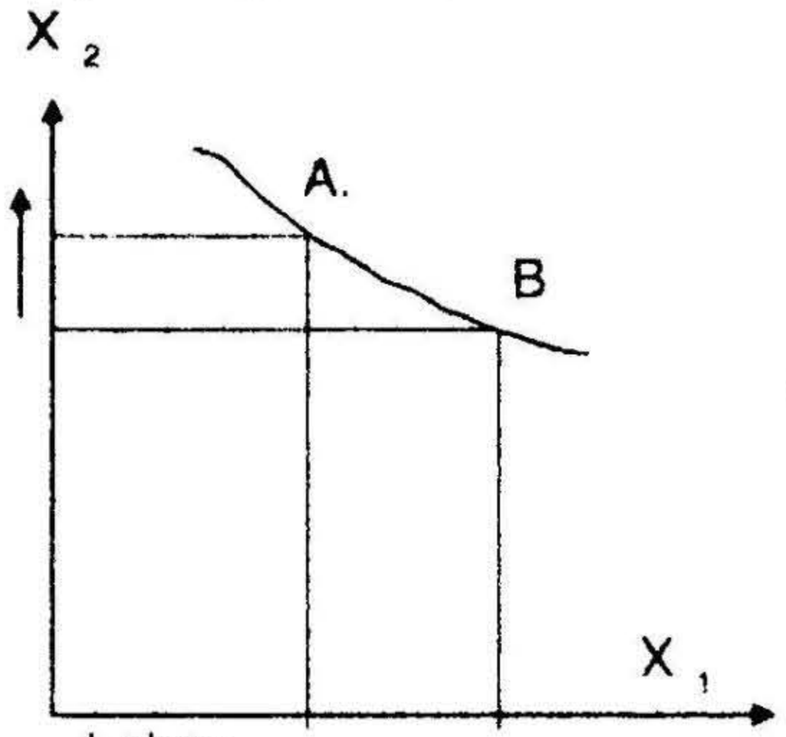


Figure: 7.2. Convex Isoquant

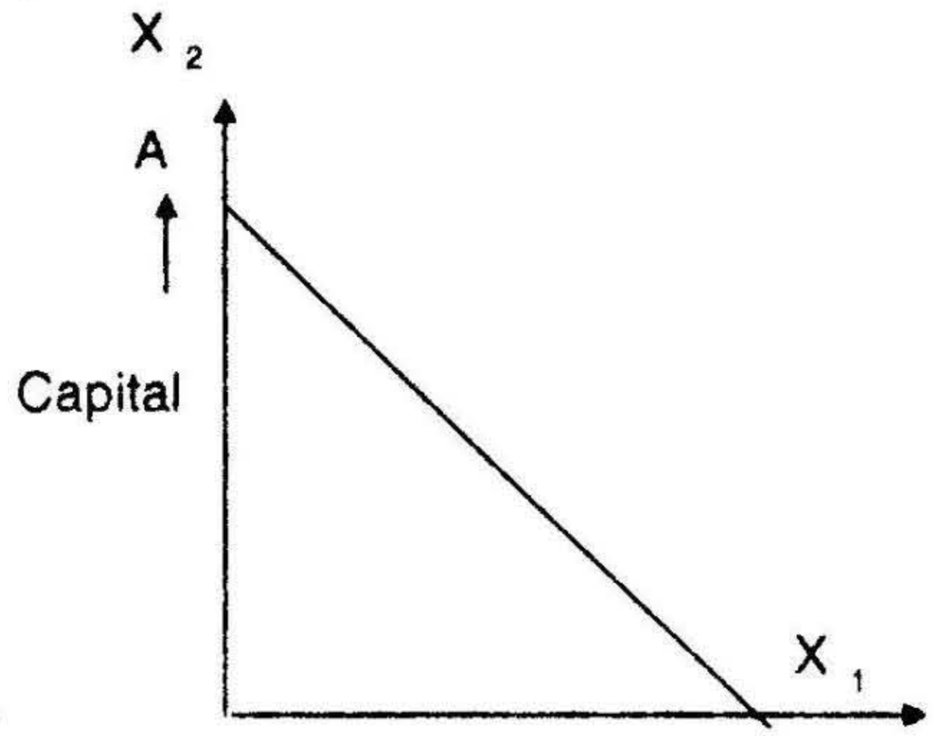


Figure: 7.3. Straight Line Isoquant

Imperfect substitution

Because of the diminishing marginal productivity of resources, the usual resource combination situation is one, which MRTS is diminishing.

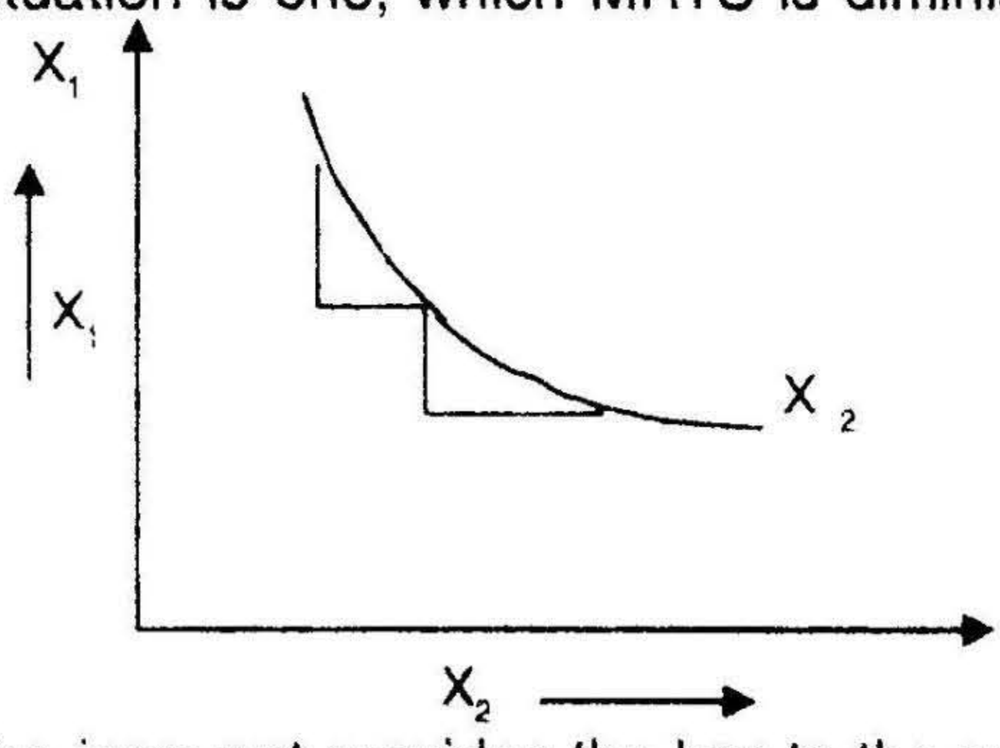


Figure: 7.4 Imperfect substitution

The slope of the isoquant provides the key to the substitutability of input factors. Profits may be increased whenever the substitute input's price relative to the other input price is less than the physical rate at which the farmer substitutes for the latter. If X_2, the substitute, is twice as costly as X_1, but it is three times as productive, cost will be reduced by substituting X_2 for x1.

Constant substitution:

There are two cases of substitution between two variable resources. When one unit of a resource may be substituted for one unit of another resource with out changing the output, the two are perfect substitutes. For example, two fertilizers of different brands but with identical contents are fully substitutable. The other case of constant substitutability is the situation when two inputs substitute at a constant rate 1:2 or 1:3 or 1:4 etc.

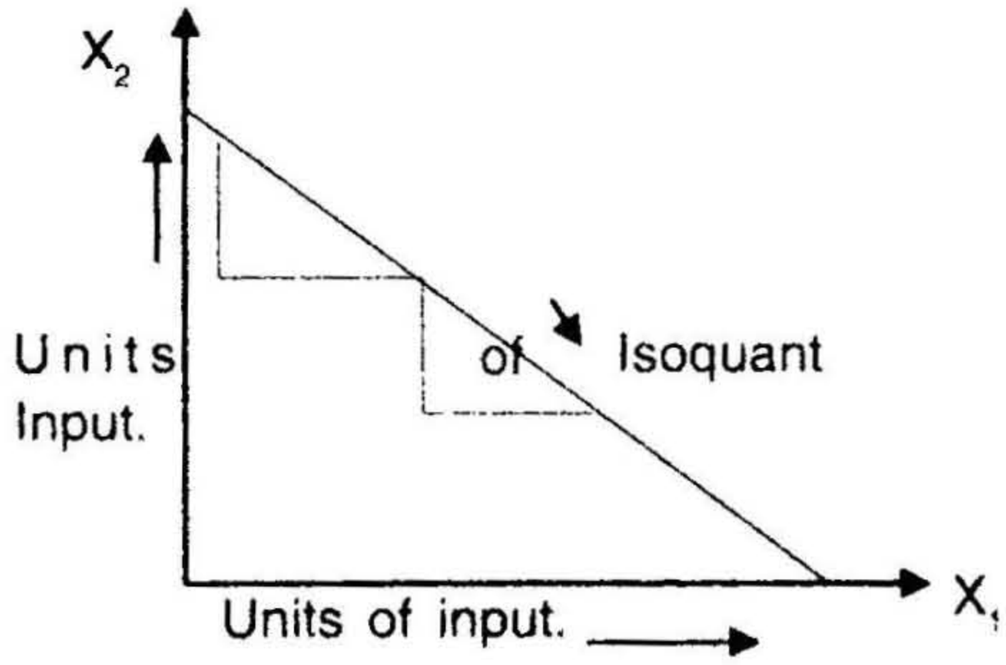


Figure : 7.5. Perfect substitution.

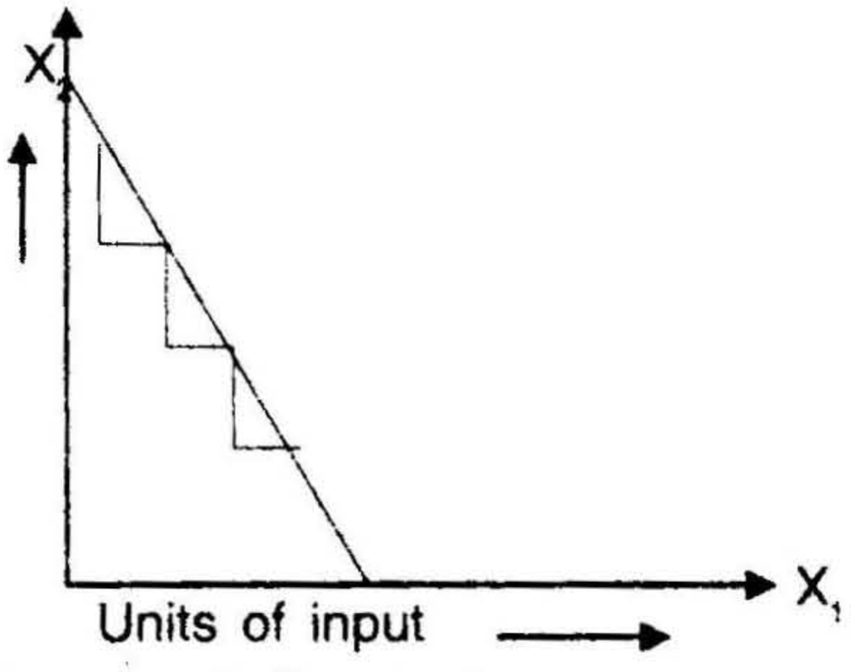


Figure: 7.6 Constant substitution.

Profit maximization for constant substitutes

Determining the least cost combination is easier for constant substitutes than for imperfect substitutes. From a cost stand point, fish farmers will use one input, the least expensive one. They will maximize profits& incentive to combine the two inputs. If the prices are the same, the farmers will be indifferent. If the prices are different farmers will choose the least expensive one.

Perfect complementarity:

At times the aquqculturists faces a situation of no substitutability. When using a tractor, a driver is needed. Such a situation is called perfect comlementarity and the MRTS = 0. Perfect complements may be represented in isoquant form as two straight lines parallel to the axis and joined at right angles, implying that increases in one factor will not increase output unless the other (complementary) factor is also increased. (Particularly for high stocking density)

Right angle isoquant

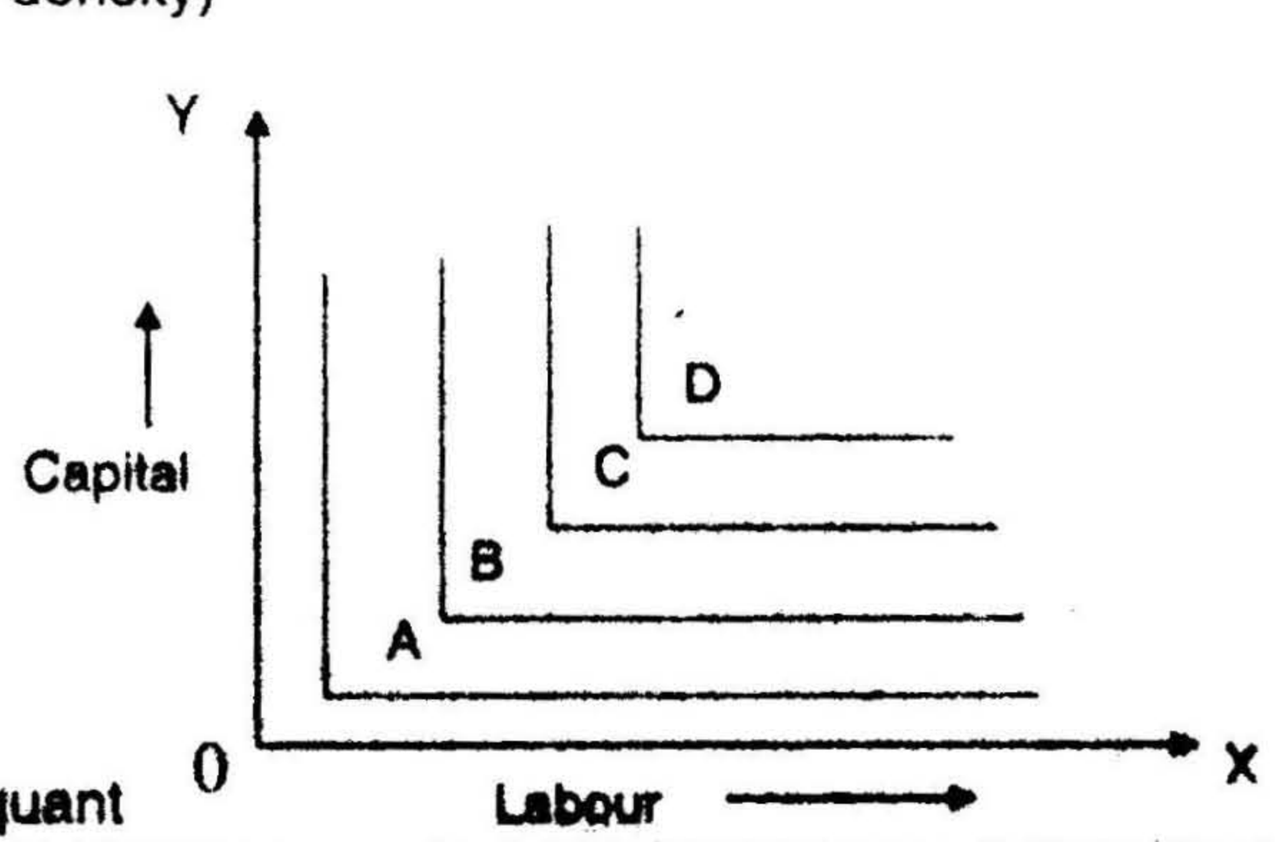


Figure: 7.6.1 Right angle isoquant

Slope of an isoquant

The slope of an isoquant is the marginal rate of substitution of one input for another. The substitution ratio (amount of x_2 replaced \ amount of x_1 added) is expressed as the marginal rate of substitution of x_1 and x_2, symbolically; $dx_2 \backslash dx_1$ shows the number of units of x_2 replaced for each unit of x_1 added.

The marginal rate of technical substitution (MRTS) is also equal to the ratio of marginal physical product.

Iso-cost lines (equal cost line):

An iso-cost line indicates all possible combinations of two inputs, which can be purchased with a given amount of investment fund. The prices of inputs are represented by Iso-cost lines, which portray the total investment surface similar to that of the production surface described by the isoquant

Slope of the iso-cost line ratio of the prices of x_1 and x_2

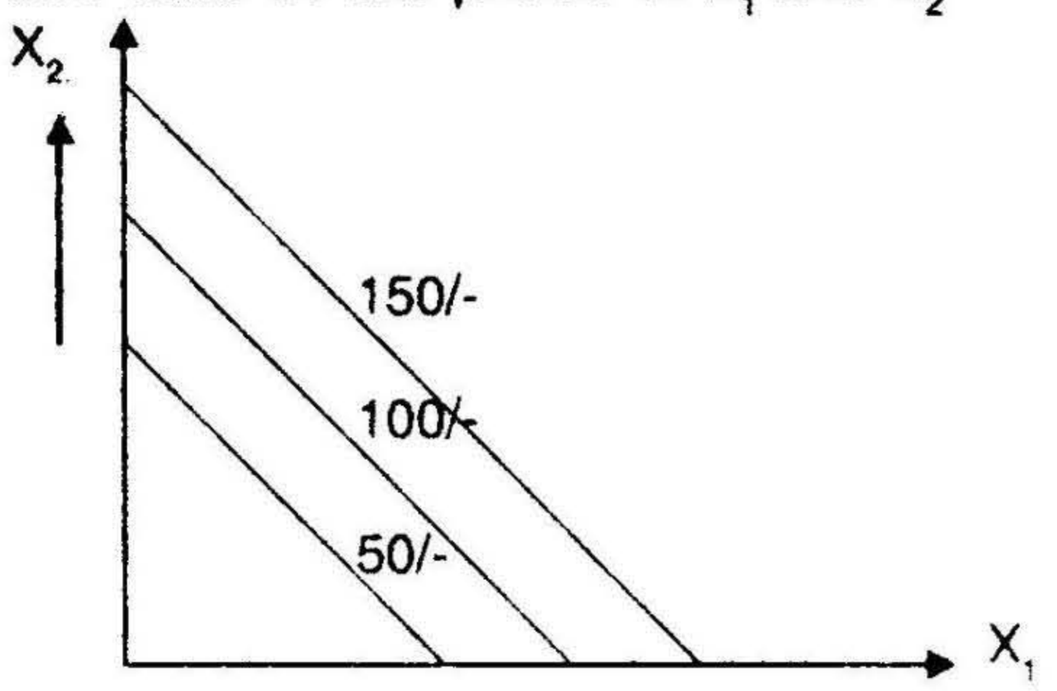


Figure: 7.7 Iso-cost lines

Note: If we increase or decrease outlay, the slope of the Iso-cost line Px_1 / Px_2 will move down or up parallel to the previous Iso-cost line. Marginal rate of substitution remains the same.

Slope of an Iso-cost line: the slope is expressed as the ratio of the price of one input to the price of another input. I.e. the slope is $=Px_1/Px_2$

Properties of Iso-cost line:

1) The Iso-cost lines are straight because a farmer has no control over the prices of inputs purchased by him.
2) Iso-cost lines farther to right portray higher cost and nearer to the left display lower costs.
3) With a change in inputs, the slope of Iso-cost line changes.

Inputs relationship:

Input relationship between two inputs or resource is of 2 types.

1) Competitive
2) Complementary

Competitive inputs:

Two resources are competitive if one can be used to replace other. For example the production of two species, which have the same feeding habits, is likely to cause competition for feed at a given point in the production process.

Complementary inputs:

Inputs are complementary when more of one input is used; more of other is required to increase production. In other words, a decrease in one input cannot be repeated by an increase in the other. Example: the production of rice and fish may be considered complementary.

Inputs can be substitutes

Inputs are substitutes when decreasing the amount of one input and increasing that of other to a certain limit maintain a given level of output.

Prices of substitutes and complements:

- **Substitutes:** When a change in price of one substitute occurs, the price of the other generally moves in the same direction. The two changes in price need not be proportional
- **Complements:** When two inputs are complements, a rise in one price can cause a fall in the other price. If the supply of input is reduced, its price will go up and so less will be purchased. With a fall in demand of the complement its price will fall.

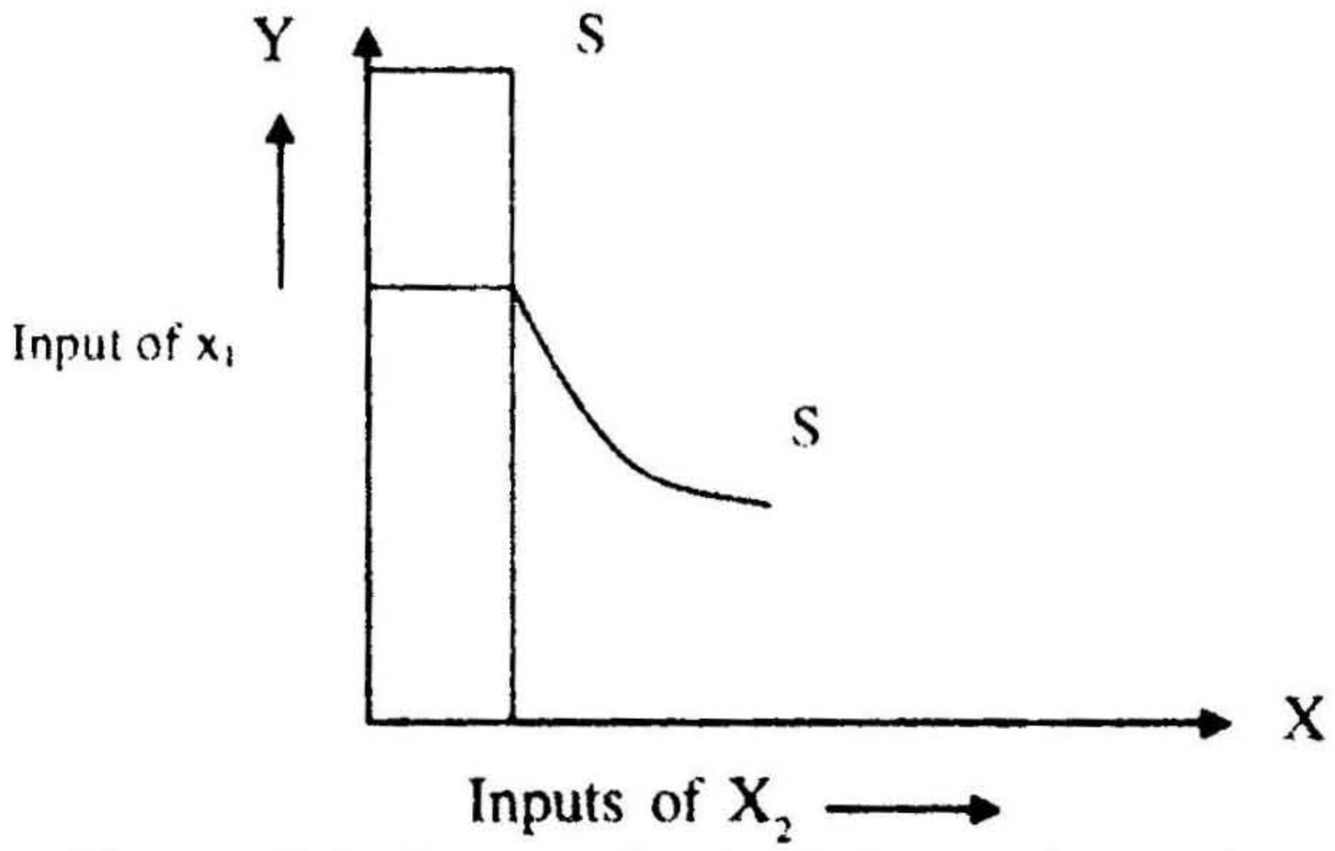


Figure: 7.9 Prices of substitutes and complements

1) X_1 complementary to X_2
Whether X_1 substitutes for X_2 or X_2 the marginal rate of substitution at a given point on the isoquant does not change.

2) Any movement down the isoquant curve ss means partial decrease of X_1 and compensating increase in X_2

The graph shows the range of complementary relationship between the inputs, X_1 and X_2, when X_2 is reduced to the level of OP and X_1 is increased to the level of ON. Therefore, not possible to substitute further that the isoproduct curve becomes vertical. The output remains constant and X_2 cannot be replaced whatever increase in X_1 is made.

Substitution between inputs at varying price (rates)

1) Substitution at a decreasing rate.

2) Substitution at a constant rate

1. **Substitution at a decreasing rate:**

The decreasing marginal rate of substitution is a common feature, i.e.

$$DX_2\backslash DX_1 > DX_2\backslash DX_1 \ldots\ldots\ldots\ldots > DX_2\backslash DX_1$$

Every successive unit of X1 replaces smaller and smaller units of X_2.

Least-cost combination:

The principle of least-cost combination of two inputs with a given level of output says that the marginal rate of substitution between inputs should be equal to (inverse) price ratio.

$$DX_1\backslash dX_2 = PX_2\backslash PX_1$$

Whether X_1 substitutes for X_2 or X_2 for X_1, the marginal rate of substitution at any given point on the isoquant would not change. The change in price ratio leads to further substitution of more costly input by cheaper input.

Least-Cost Combination of Inputs

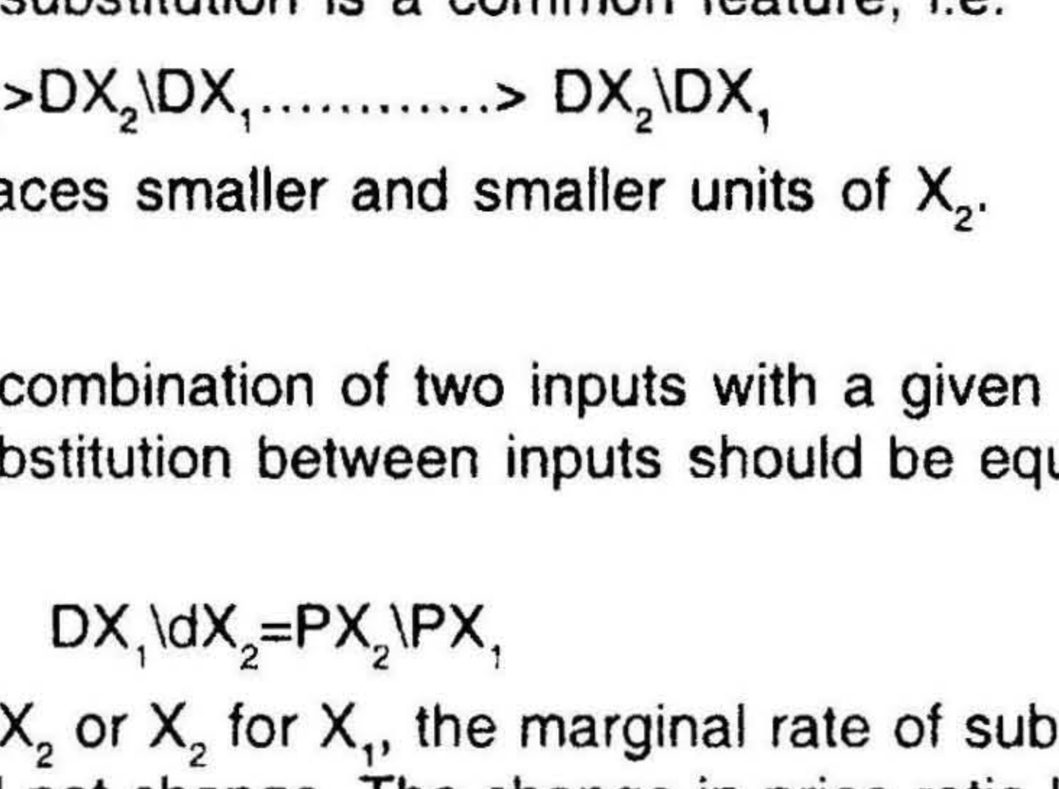


Figure: 7.9. Least-Cost Combination of Inputs

The condition of minimum cost is that the isoquant should be tangent to the Iso-cost line or the slope of isoquant must be equal to the slope of iso-cost line. In figure, the least-cost point is E, where isoquant is tangent to the iso-cost line. At the point of tangency, the slopes of both curves are equal. For e.g. if: the price of one of the inputs, say of the feed decreases, more of it will be purchased and vice-versa.

3) Constant rate of substitution:

$$D_1X_2 / D_1X_1 = D_2X_2 / D_2X_1 = \ldots\ldots\ldots\ldots D_nX_2 / D_nX_1$$

If the substitution is perfect and the second input is obtainable at a fixed price, the two inputs can be substituted for one another for a given level of output at a constant rate and the cost would not rise at all.

Constant rate of substitution with varying prices for a given level of output:

Substitution rate of one factor for another remaining the same, how to minimize cost with changes in price ratios is dealt with here.

Case 1: price ratio is equal to substitution ratio. Hence, the question of cost reduction does not arise. Use any input.

Case 2: price ratio is less than marginal rate of substitution. Cost is decreasing. Hence go on substituting X_2 and X_1 for minimizing cost.

Case 3 : price ratio is greater than MRTS. Cost is increasing. Hence X_1 should not be used.

Region of irrational input combinations:

The irrationality of input combinations arise when we spend more on inputs for getting the same amount of product at a lower cost shows that the iso-product's rational region of production. In this region, positive change in one input is always associated with a negative change in the other. By the application of the principle of least-cost combination of inputs, we can locate the point of least-cost combination of inputs. Beyond points R and T, upward we enter the irrational regions, because there we can not substitute one input for the other with the result that if one input is increased the other will have to be increased for getting the same level of output at a greater cost.

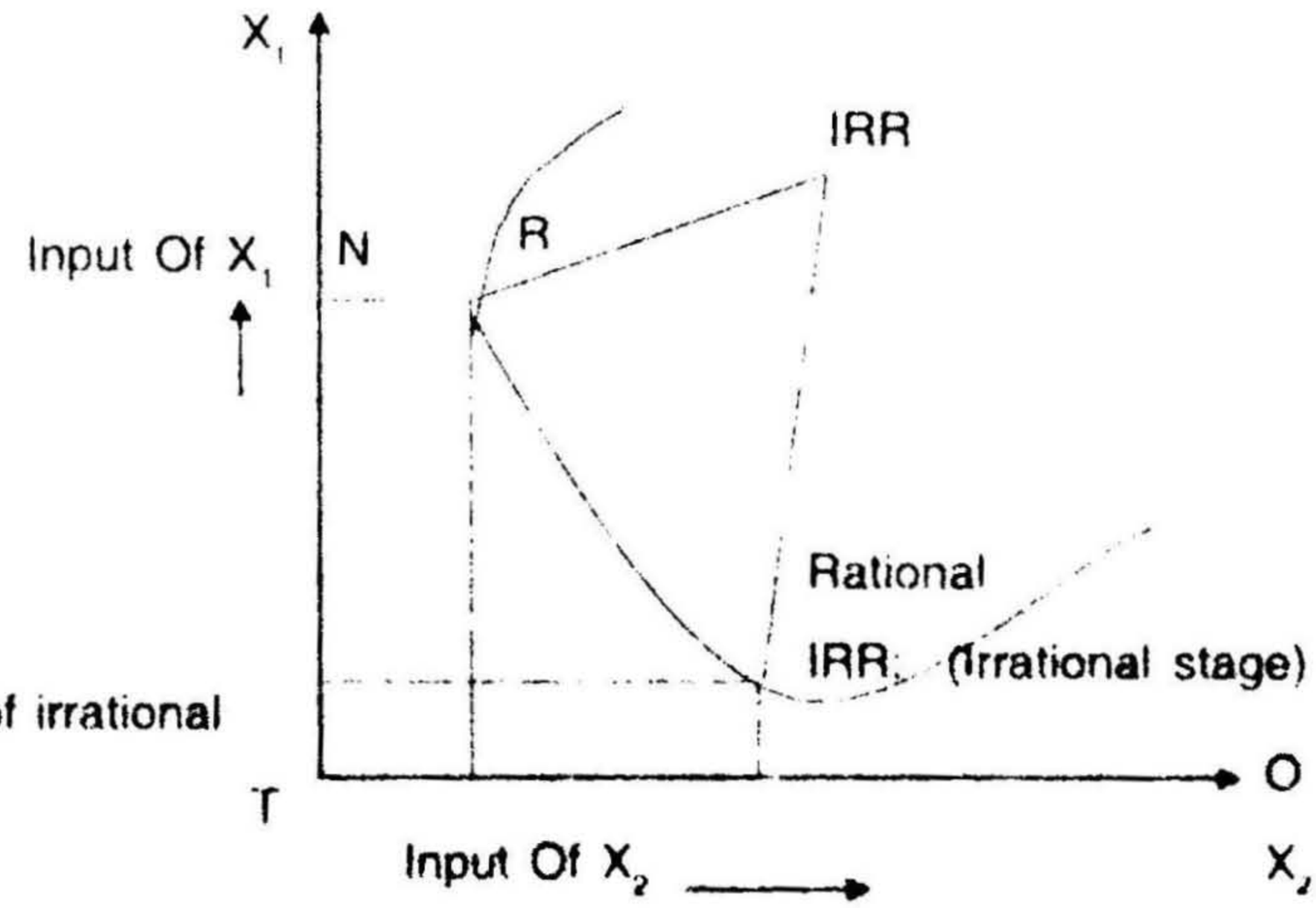


Figure : 7.11 Region of irrational input combinations

Scale line

It is defined as the locus us points of tangency between the equal

product curves and iso-cost lines. The scale-line or expansion path could also be explained with the help of the equal product map and the iso-cost lines.

To start with, let us suppose that the prices of X and Y are represented by the slope of AB iso-cost line. A_2B_2 and A_3B_3 represent different levels of total cost. Since the prices of the two factors are given, the various iso-cost lines are parallel to the each other. If the firm wishes to produce an output indicated by the equal product curve E, then it will choose the factor-combination P, because it is the least-cost combination of the two factors. P is the point of tangency between the equal product curves E and the iso-cost line AB. Linkage, if the firm wishes to produce an output represented by the equal product curve E_2. It will then choose the factor-combination P, because it is the least-cost combination for that level of outputs P_2 and P_3 are the optimum points.

The line connecting the various minimum cost combinations such as P, P_1, P_2, is called the scale-line or the expansion path. This line indicates the various optimum combinations of the factors as firm expands its output. The expansion path may, thus be defined as the locus of the various points of tangency between the equal product curves and iso-cost lines. The shape and slope of the expansion path depends upon the relative prices of the two factors and the shape of the equal product curves. The rational entrepreneur will always seek to produce at one or the other point on this expansion path.

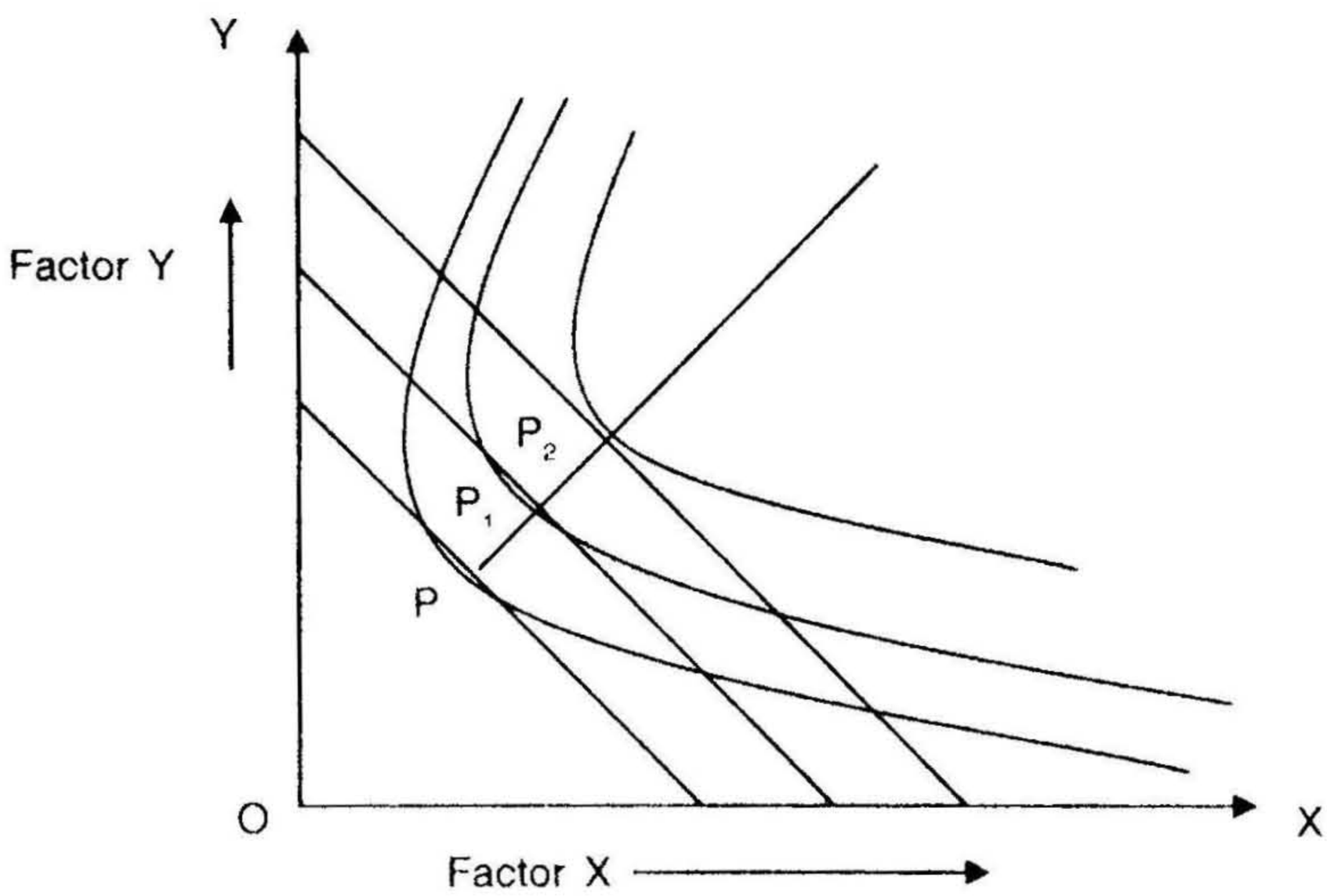


Figure: 7.12 Scale line

Ridgelines:

The ridgeline is the line joining the endpoints of isoquant is called ridge or borderlines. They are boundary lines, which separate the area of complementary relationship between products from the area of competitive relationship between them.

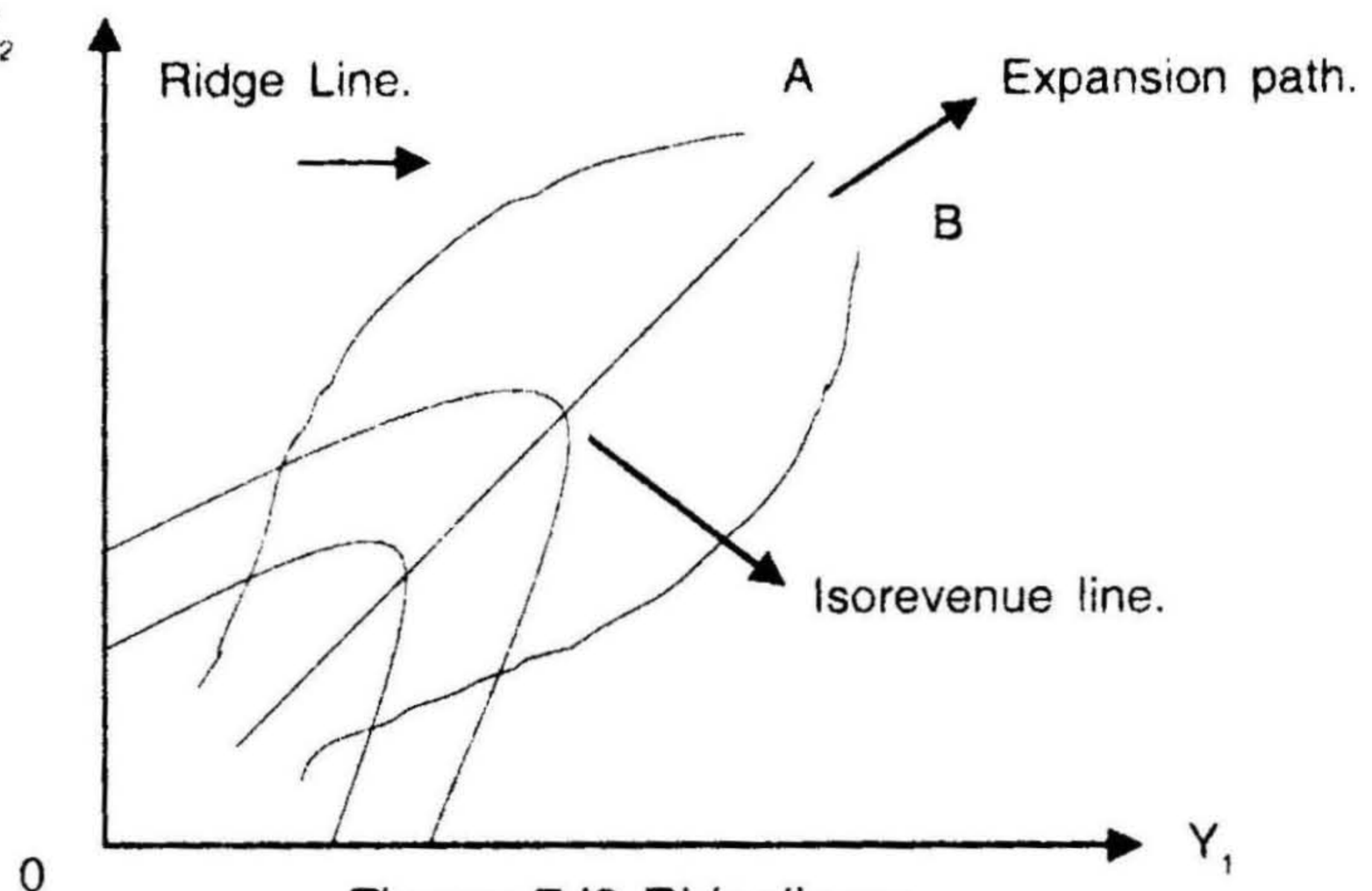


Figure: 7.I3 Ridgelines:

The area with in the ridgeline is a rational region and beyond them, the two regions are irrational, because each factor contribution is negative. The isoquant begins to curve upward and theoretically may assume round shapes. With in the ridgelines, we went to produce the given quantity of product at a minimum cost. To attain this, the marginal rate of substitution between the two inputs X_1 and X_2 must be equal to the (inverse) ratio of their prices.

$$DX_2 / DX_1 = PX_1 / PX_2$$

Isoclines

Isoclines means equal slope. With input price ratio being constant for each isoquant, the MRS between the inputs is the same for each level of output. There may be many isoclines for different combination of input prices.

Combination of more than two inputs:

The principle of least-cost combination of two variable inputs can be extended to three and more inputs for a given level of output. We use the following equations.

A) When marginal physical products (MPP) and the prices of the inputs are considered.

$$Dy / Dx_1 / Px_1 = Dy / Dx_2 / Px_2 = \ldots\ldots = Dy / Dx_n / Px_n$$

$$MPPx_1 / Px_1 = MPPx_2 / Px_2 = \ldots\ldots = MPPx_n / Px_n$$

The equation states that the inputs are being used in their optimum proportion when the product of the last unit of x1 has the same relationship to the price of x1 as existed for x_1 and x_2

B) When marginal value products (MVP) and the prices of inputs are considered:

$$Dy / Dx_1 . Py / Px_1 = Dy / Dx . Py / Px_2 = \ldots Dy / Dx_n . Py / Px_n = 1$$

CHAPTER VIII

PRODUCT- PRODUCT RELATIONSHIP

Introduction

The optimum combination of two or more than two products for a given level of input is considered under product-product relationship.

The general equilibrium condition for a given level of inputs requires knowledge of two relationships.

a) Iso-revenue line (curve) or choice function

b) Production possibility curve.

The law of equi –marginal returns and law of opportunity cost are the farm management principles which founds applicability in the case of the product- product relationship

The law of equi-marginal returns

A further illustration of the law of diminishing returns can be explained by the law of equi-marginal returns, which is concerned with allocation of the same amount of limited resource among different enterprises. The law states that using resource in such a way that the marginal returns form that resource maximizes profits are equal in all cases.

Table: 8:1 Total product (TP) and Marginal.

Units of N (Each unit of 40 kg)	Physical Product (MPP). TP		MP	
	Y_1	Y_2	Y_1	Y_2
	Qts/ha		Qts/ha	
0	20	21	20	21
1	40	44	[10]	12
2	50	56	9	[10]
3	59	66	4	4
4	63	70	-3	-2
5	60	68		

Example: Let us assume in Table 2.2 that a farmer has 200 kgs of nitrogen with him for application to two Y_1 and Y_2 HYN of carp whose N requirements are 120 kgs and 140 kgs, per hectare respectively.

By using 2x40 = 80 kgs on Y_1 and 3 x 40 = 120 kgs on Y_2 we find that their marginal physical products are equated. Hence we get the maximum of 116 Qts.

But we are interested more in economic returns. As such the physical returns should be converted into rupees and then see that the return of the last rupee in each use is equal in order to maximize profit.

$$\frac{DY}{DX} Py2 \quad \frac{X}{Y} \frac{DY}{DX} PYn > Px$$

The marginal returns are equal. But each enterprise is getting less input in comparison to added cost added return principle

Example: A farmer has Rs.3000 and wants to grow carp, catfish, and milkfish that are suitable fro his farm situation. What amount of money should be spent on each enterprise to obtain highest profit?

Table: 8.2 Addition to income from the marginal amount of Rs.500.

Amount of money spent	Carp	Catfish	Milk fish
Rs.	Rs.	Rs.	Rs.
5000	800	750	650
1000	700	650	560
1500	650	580	550
2000	640	540	510
2500	630	520	505
3000	605	510	500
Total returns	4025	3550	3275
Net profit	1025	550	275
Average return per rupee at Rs. 3000	1.34	1.18	1.09

Inference from above table

Should a farmer follow the law of average returns or equi-marginal returns? If he goes by the average returns, he gets a net profit of Rs.1025/- on carp. On the other hand, if the law of equi-marginal returns guides him where the marginal returns in each direction of his investment on the three crops are equalized, he gets a net profit Rs. 1200/-. Therefore of his investment, he should spend Rs.1500/- on carp Rs.1000/- on catfish and Rs. 500 on milkfish.

What is the practical utility of the law of Equi-marginal returns?

i) It guides the farmer to plan his budget for the preparation of his cropping scheme and fitting therein his livestock programme.
ii) It enables him to determine enterprise relationship complementary or competitive.
iii) It provides guidance to the adoption of diversified or specialized farming as there is a profitable limit for each enterprise as well as most profitable enterprise for each farm.

Law of Equi-marginal Returns Vs. Added Cost-Added Return Principle

Both the laws are obedient to the Law of Diminishing Returns. But their application depends upon the availability of the capital input. When capital is limited, the farmer must obviously stop short of its application to the level where MC=MR. He is handicapped to follow the added cost added return principle, because if he uses more of it in one enterprise, there will be equivalent decrease in its use for other enterprises with the result

that profit cannot be maximized. As against this situation, where capital is unlimited, profit is maximized when its application is extended to the level where MC = MR – the essence of the added return principle.

The law of opportunity cost

Underlying the concept of equi-marginal returns is the idea of opportunity cost or alternative cost. An opportunity cost is the earning from the next best alternative sacrificed.

Example: If a pair of bullock labour earns Rs. 20 per day on pond preparation, but it can also earn Rs. 25 per day in the alternative employment of carting, opportunity cost of ploughing is Rs. 25 per day i.e., the value of the bullock labour in its best alternative use.

Under subsistence type of farming, the concept of opportunity cost can be applied to the production of the cash crops. But the alternative earning (opportunity cost) can only be determined by projected cash outlay cost and net returns.

Iso-revenue line (curve) or choice function:

It represents the ratio of prices of two competing products. It indicates the different combinations of two products, which give the same amount of revenue or income.

The line joining the points at 50 and 25 is an iso-revenue line. The iso-revenue line for a given price ratio has the same slope i.e.\Py where Px is the price of the input and Py is the price of product. Hence the price line is also called iso-revenue or iso-income line. The slope of the price line (price ratio of the products) will change if there is a change in the price ratio.

$$Dy1 / Dy2 = Py2 / Py1$$

Or $$Py1 (Dy1) = Py2 (Dy2)$$

The iso-revenue lines are constructed in the same way as cost lines. The farther from the origin is the iso-revenue line, the greater will be the t

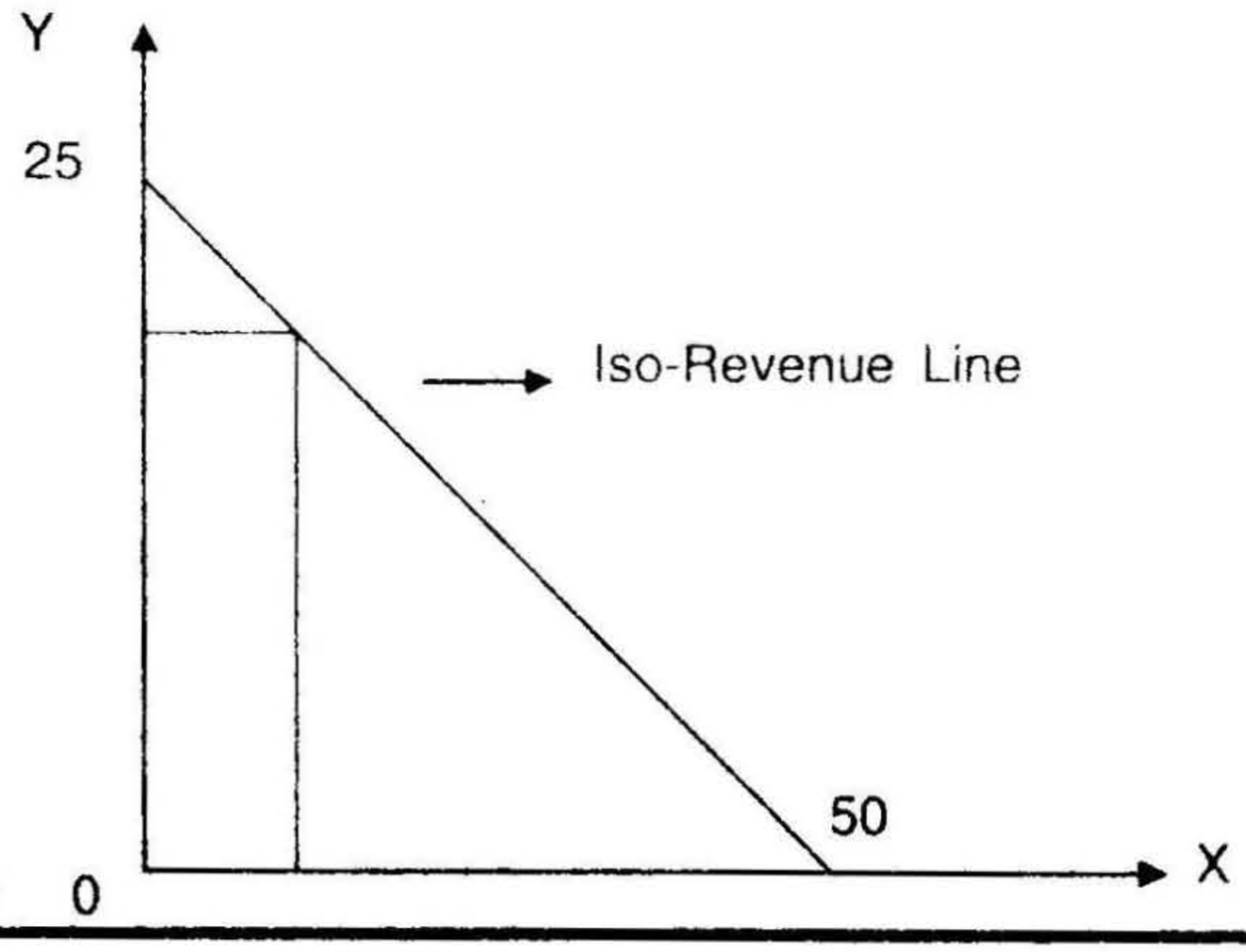


Figure: 8.1 Iso-Revenue Line

Iso-revenue line and elasticity of substitution:

In the readjustments of products combination we are guided by the principle of elasticity of substitution, which takes place with in a certain range. With a rise or fall in the price of a product, we substitute a little of one product for one product for a little of another, there by changing the position of the iso-revenue line. But ultimately, the state of equilibrium and the position of the iso-revenue line that have previously been in existence would tend to come back to the original position because of the tendency of competition to reduce prices to equality with the input with the average cost of a marginal farmer.

Characteristics of an iso-revenue line:

1. It will always be a straight line, because the prices of the products do not change with the change in the quantity of products.
2. The position of the iso-revenue line shows the magnitude of the total revenue. If the total revenue increases, the line will move farther northeast.
3. Change in price of one product is accompanied by a shift in the iso-revenue line.

Production possibility curve:

The product-product model attempts to answer the question of what products the firm should produce so as to satisfy the objective of maximizing returns for a given level of cost. Two microeconomic tools are necessary for solving the problem posed in this model. One is product transformation curve, also known as the production possibility curve.

The curve shows the possible combinations of products Y1 and Y2 that can be produced with a given level of stock of input and technology. We may produce either all of Y1, all of Y2, or a combination of both. If we increase the production of Y2, then more and more of Y1 must be sacrificed and vice versa. The rate at which one output is sacrificed for the other is called marginal rate of product substitution (MRTS).

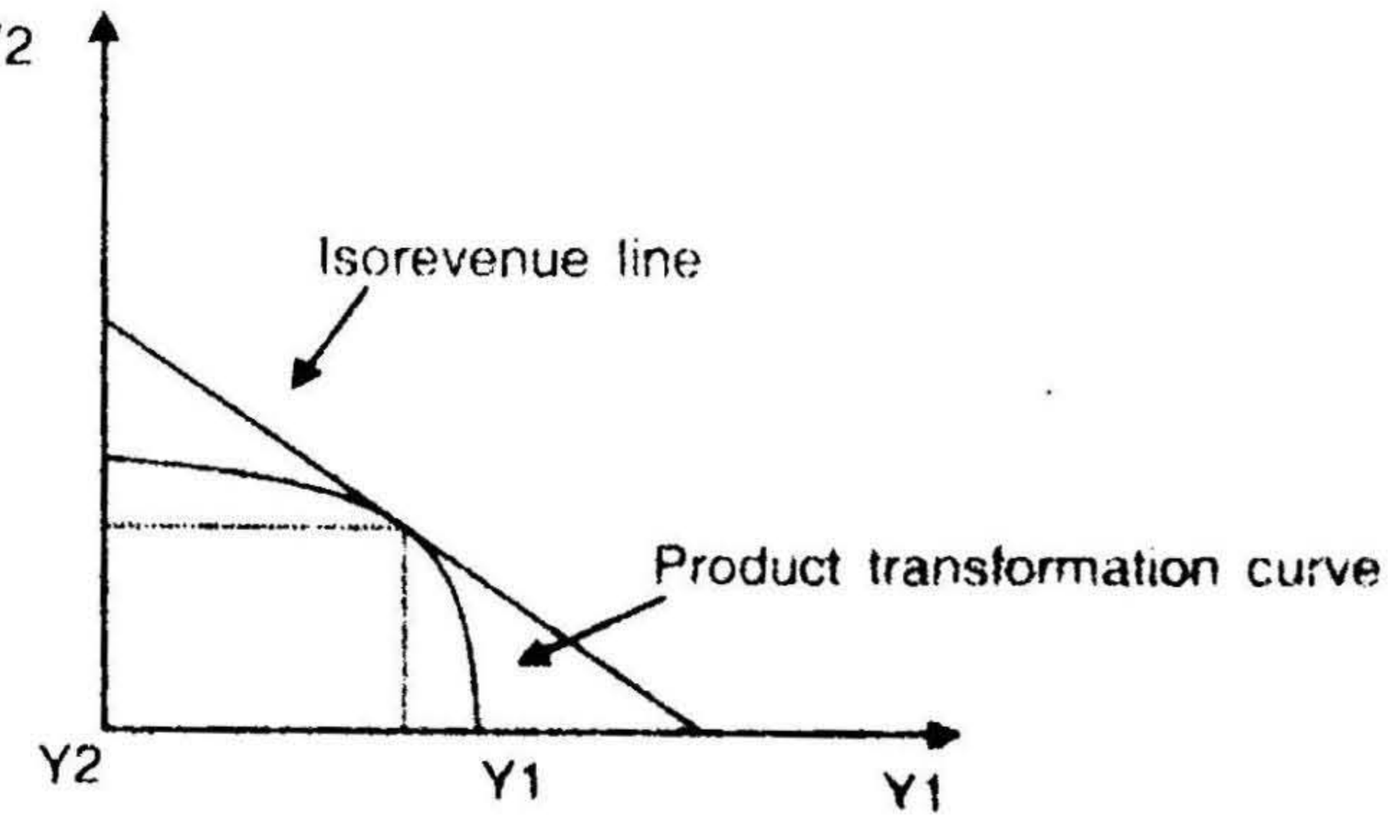


Figure : 8.2 Production possibility curve

The marginal rate of product substitution

The marginal rate of product substitution (MRPS) is the amount by which an output changes in quantity when one unit increases the other output, given that the amount of input and technology used remain constant. The MRPS of Y1 for Y2 is:

MRPS=Dy2/ Dy1

The MRPS represents the slope of production possibility curve.

Time comparison principle:

Farm management involves dynamic adjustments of the farm organization and operations. Such an adjustment relates to taking account of;

1) Time element in the calculation of present value of future incomes.

2) The risks and uncertainties involved in farm operation over time.

The first adjustment involves a method of discounting the future returns. The rate of discounting will perhaps be lower for a farmer with limited capital.

The risks and uncertainties are a general rule in agriculture; while some risks are insurable the others are not. The most important risks and uncertainties occur due to natural calamities, fluctuations in prices of inputs and output changes brought about by innovations and other technological improvements. Producers tend to discount returns to adjust for these uncertainties.

Some farmers are security minded and are advice to taking reverse. Such farmers will be reluctant to adopt new practices or enterprises. Thus, they discount for the uncertainties at a very high rate.

Time has very significant influences on costs and returns and as a result involves considerations, which should be recognized in managerial decisions. There are many decision situations where the principle finds applications, such as, soil conservation programme, which bear fruit over a long time. Use of land for growing crops or putting it under an orchard, which may not give returns for 5 to 10 years;

Two aspects are considered

a) Growth of cash outlay over time.

b) Discounting of future income.

a) **Growth of cash outlay**: The cash outlay grows over time due to the compounding of interest changes or opportunity costs involved in using the capital. Cash outlay or investment made in a farm business grows overtime. Farm improvement, machinery, breeding stock is examples while such item depreciate over time; growth of the remaining capital invested has to be considered in the analysis whether the investment will be profitable. Since cost grow as a result of interest or opportunity cost accumulations, the

equation for compounding interest may be used to show growth in the cash outlay.

$$S=s\ (1+I)^{n}$$

Where, S= sum at the end of 'n' period, s= the amount which is invested for 'n' period, I=interest rate.

b) **Discounting income**: Discounting income is the procedure where by the present value of the future income is determined. The concept is the reverse of 'growth in value'.

$$Pv = q \setminus (1+r)^{n},$$

Where,

Pv = present value of the amount.

q = future amount.

r = rate of interest.

n = numbers of years in the future.

Profit maximization

Maximizing profit requires that the product be produced at minimum cost. To determine the least cost input combination, the price of each input and the MRTS between inputs must be known. When they are known, the profit maximizing combination may be determined by finding the point where the MRTS is equal to the inverse of price ratios. This point is synonymous with the point where the isoquant is tangent to the price ratio.

The MP of each unit of input should be related to its price. A fish farmer who uses any two inputs, say labour and capital, in the production of tilapia should use each of the inputs so that the MP of one input divided by its price is equal to the MP of the other input divided by its price.

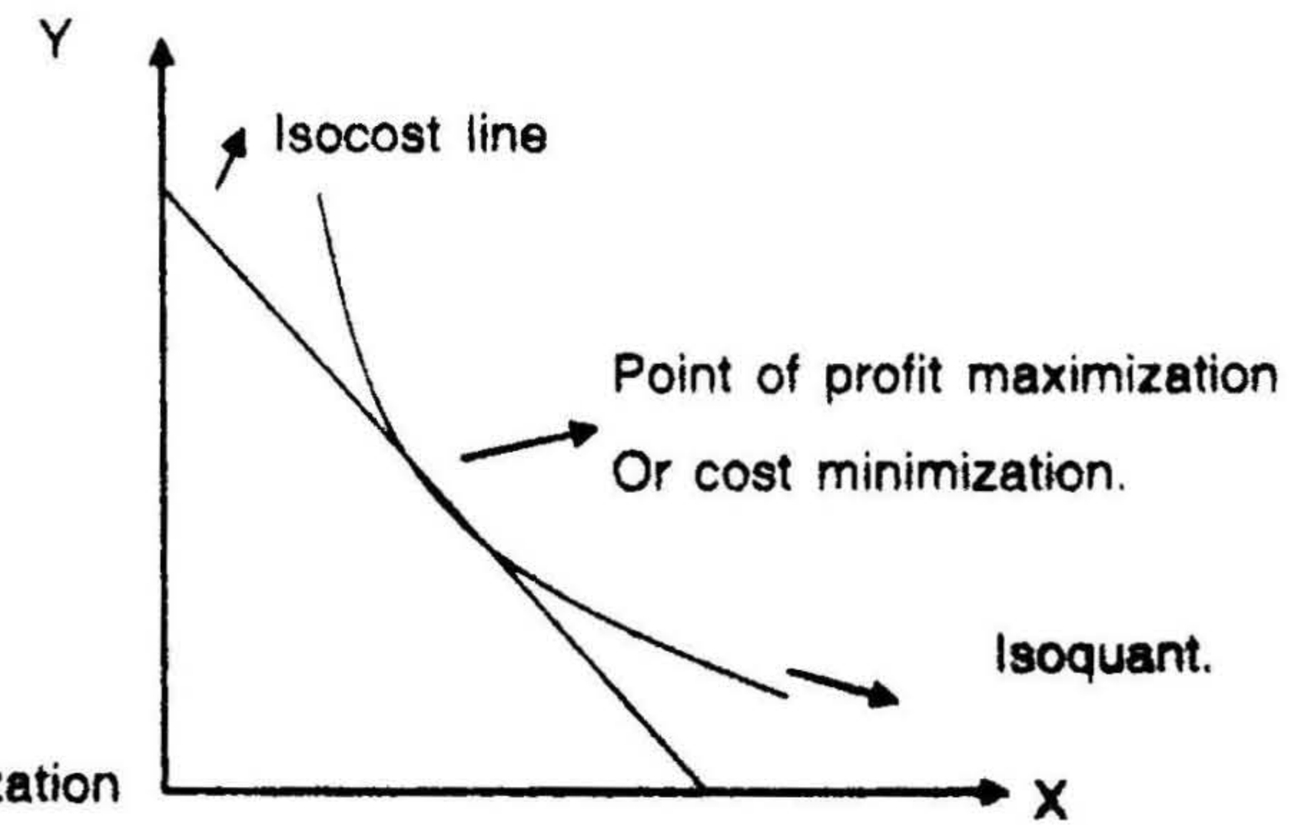


Figure: 8.3 Profit Maximization

At this point, the fish farmer has no incentive to replace one input with the other since their marginal products in relation to their prices are equal. This relationship would hold for any number of inputs. In the above figure, the tangency of the isocost line to the

isoquant indicate that the input price ratio Px1 / Px2 is equal to the MRTSx2 for x1 and the farmer will choose a combination of inputs in the production of a given quantity of output where:

$$MPx1 / Px1 = MPx2 / Px2$$

$$\text{i.e. } MPx1 / MPx2 = Px1 / Px2$$

If a combination of x1 and x2 units of inputs were chosen at A the same quantity of output would be produced as at a point B, but at a higher cost. Point B shows the point of least cost for the production of the given level of output.

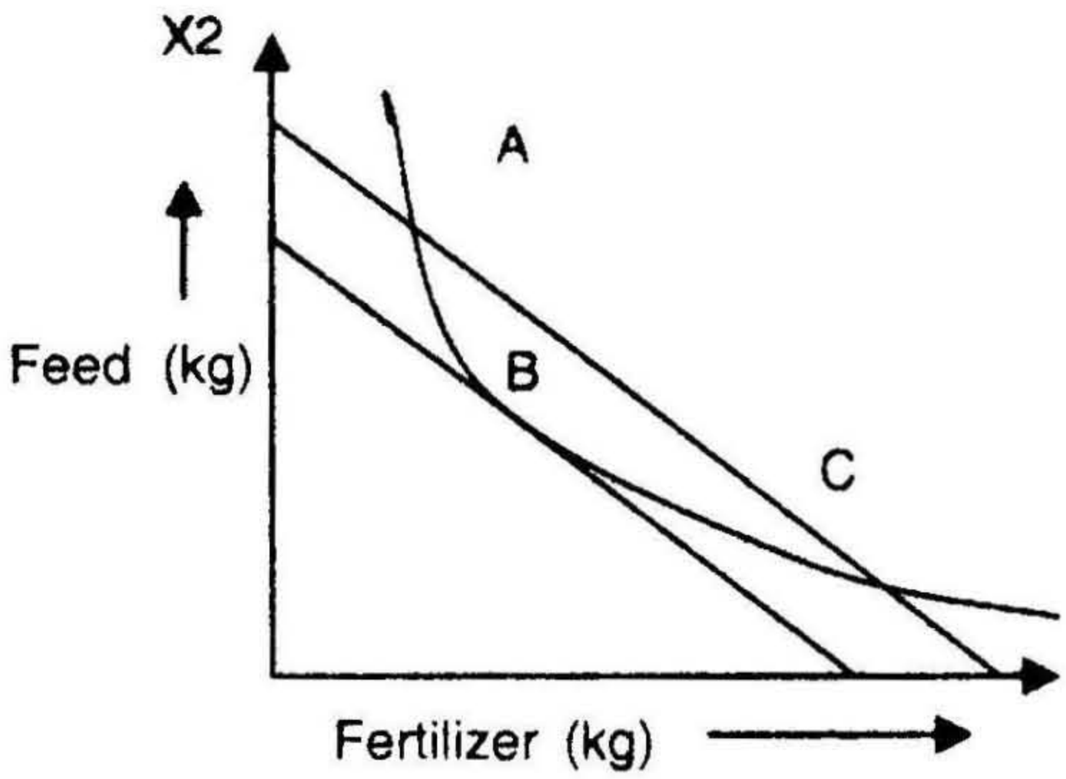


Figure : 8.4
Profit Maximisation

Fish producers have learned to maximize the level of output by producing species, which complement each other. If the species are chosen carefully and in a right way, it has been observed that total production of the two species is increased. How ever if the species are not chosen carefully, the total output will be lessened.

The law of comparative advantage

It is evident from the fact that farmers try to produce those commodities that maximize their net income. They normally include in their cropping scheme as large an area as possible of the most profitable crops for the area and for their particular farms. Hence, the determination of type of farming is based upon the principle of comparative advantage.

The concept of comparative advantage is associated with

(i) Resource endowment,
(ii) Resource productivity and
(iii) Cost of production of enterprises. If there are equal differences in costs, the comparative advantage is equal. In such a situation, the consideration of specialization and diversification does not arise.

How does the law direct the fish farmer in farming?

The law of competitive advantage directs a farmer in the selection of the fish crop enterprises in the production of which available resources have the greatest relative and not absolute advantage. The specialized or diversified fish farming depends largely on the principles of comparative advantage.

6. Principle of combining enterprises (Product-product relationship)

The Principle of combining enterprises requires a prior study of the nature of relationship between enterprises. As enterprise is generally understood the production of a crop or livestock. But in actual practice when we say dairy enterprise, we mean the raising of cows and buffaloes as components of a single dairy enterprise. Similarly vegetable enterprise includes many kinds of vegetables.

Enterprise relationship

Enterprise has the following relationships to each other according to their relative contribution to farm income.

1. Main enterprise
2. Complementary enterprise
3. Supplementary enterprise
4. Competitive enterprise

To utilize the terms referred to above, the following table has been constructed to indicate also the relationship between enterprises.

Table: 8.3 : Enterprise Relationship

Production		Y_1	Y_2	DY_1	DY_2	Remarks enterprise
DY_1	DY_2			DY_2	DY_1	relationships DY_1 or DY_2 DY_2 DY_1
8	7	3	2	1.5	0.67	>0 (Positive)
11	9	3	2	1.5	0.67	Complementary
10	10	-1	1	-1.0	-1.0	<0 (Negative)
9	11	-1	1	-1.0	-1.0	Competitive
8	12	-1	1	-1.0	-1.0	
8	12.5	0	0.5	0	μ	>0 Supplementary
8	13	0	0.5	0	μ	

To recapitulate

Table: 8.4 Enterprise Relationship .

MRS of one enterprise for another	Enterprise relationship
> Zero	Complementary
< Zero	Competitive
= Zero	Supplementary

Main enterprise – A main enterprise is the one, which provides the most important source of revenue on a farm. If uses a very large portion of the farm sources – land, labour, capital and management. In the high Himalayas, trout farming is the main enterprise of the farmers. In the eastern part of India, carp farming and in the western region wheat farming are the main enterprises.

Complementary enterprise – Complementary enterprises are those enterprises, which help each other and do not compete for resources-land, labour, and equipment. They contribute to the mutual production. Fish farming and livestock rising are complementary. Mixed cropping like carp+prawn, milkfish+tilapia etc establish complementary relationship. Complementary relationship means higher returns from fixed costs. One or both of the two products that stands in complementary relationship give higher yields and gross returns.

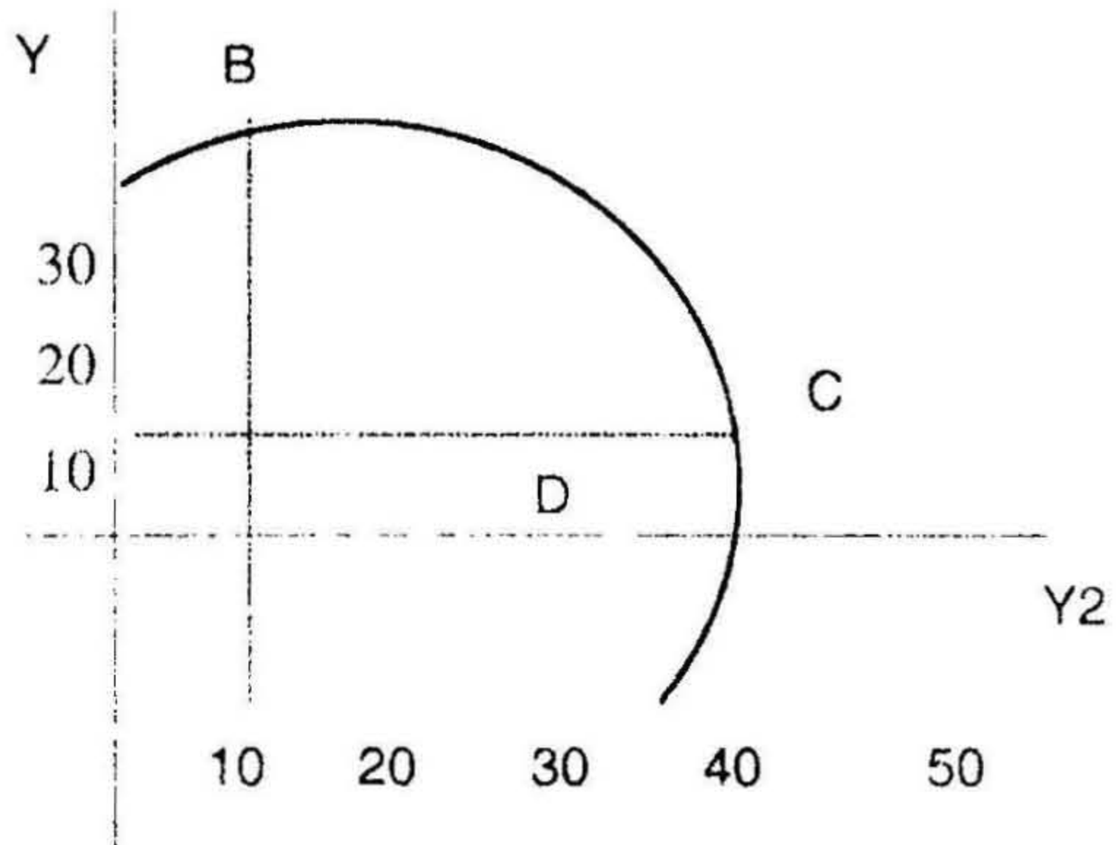


Figure: 8.5 Complementary relationship between two products:

Supplementary enterprise - Supplementary enterprises are those enterprises, which do not compete in the use of resources and rather make use of resources when they are not being utilized by one enterprise. They are independent, as the relationship of prices has nothing to do with the amount to be produced.

Supplementary relationship increases profit by improving resource use. Two or more enterprises are able to share the services from capital good or other resources with cost

remaining fixed and thereby increasing the profit margin per unit of cultivation.

In crop production, most of the work is seasonal and labour remains unutilized or under-utilized during the slack season. Farmers can take up poultry or bee keeping as supplementary enterprise.

CHAPTER IX
COSTS AND INCOME CONCEPTS IN FISHERIES

Introduction

Production may be defined as the process of combining resources and forces in the creation of some valuable goods or services. The major objective of production is to satisfy human wants and needs. People engage in production to obtain the means by which they will be able to satisfy their own wants and at the same time help satisfy those of other people. Production covers the following activities

a) Changing the form of the good – raw material to finished good

b) Changing the situation of the good – production of fish at farm

c) Changing the position of the good in time – over wintering

d) Provision of some service – providing farmers with technical advice

For producing any commodity there should be some inputs, which in turn contribute towards the output, which goes for satisfying the wants or needs of the people. The purpose of production is thus to raise the standard of living and quality of life by enabling people to satisfy more fully a greater number of wants.

Factors of production

Production involves many factors, which can be classified into four main categories. They are known as the factors of production i.e., land, labour, capital and management or organization.

a) Land:

It is the naturally available wealth that is used for the purpose of production. Land doesn't merely include soil but also the trees, minerals, water, stream and ponds.

b) Capital:

It is the produced good used in production. The difference between land and capital is that the latter is manmade rather than found in nature.

E.g.: fertilizer, feed, sheds, money, and technologies

c) Labour:

It is the physical energy used in production. It can be operator's labour, family or hired labour.

d) Organisation or Management

It is the organisation of all the activities, which are required in the production process. It refers to the mental energy rather than the physical energy. Management is directly concerned with decision-making and risk bearing

For example if we take the case of fish production, we can see that it involves the combination of aquatic resources, labour and management to obtain a consumable good. When the different factors such as feed, seed, water quality parameters etc are varied the response of the fish to each of these will be different. These response curves are always considered while establishing the cost efficient level of production. For producing a particular commodity there requires certain inputs and the amount paid for purchasing all the requirements constitute the costs involved

Costs of production

Costs of production refer to the money expenditure by a firm on the factors of production for producing a commodity. The expenditure may be in the form of rent for land, wages and salaries for labour, interest for capital, profit for organisation, cost for raw materials etc. The cost of production is also known as the money cost of production or the nominal cost. Costs incurred in the production of goods include normal returns on the investment of time and assets.

Cost concepts

Real cost: Real cost means the actual efforts and sacrifices required for the production of a commodity. It is usually regarded as the pains and sacrifices of the labour.

Opportunity cost: The real cost of production of a given commodity is the next best alternative sacrificed in order to obtain that commodity. It is also called the opportunity cost or the displacement cost. It implies that the cost of anything is the value of the alternative or the opportunity that is sacrificed.

Implicit and explicit cost: Implicit costs are the opportunity costs that are not reflected in the farmers accounting statement. The costs of self owned, self-employed resources are the non-expenditures or the implicit costs. Explicit costs can be considered as the accounting expenses. The monetary payments that a firm makes to those outsiders who supply labour, services, materials, fuel, transportation, power etc are called the explicit costs.

Private and social costs: The costs incurred by an individual firm are called the private costs. It is the sum total of implicit and explicit costs that a firm incurs in the production of a good. On the other hand the cost incurred by the society is called the social cost

Fixed costs (FC): It is otherwise called the prime costs which doesn't change with the level of input i.e., those that must be paid regardless of whether the farmer engages in

production or not. These costs include land, property taxes, interests on capital investment, salaries of top management and key personnel.

Variable costs (VC): It is otherwise known as operating or working or supplementary costs, which change with the level of production. It is the cost incurred for buying the items that is used in the production. When the production has not started the variable cost will be zero since there is no input. Total variable costs are computed by multiplying the amount of variable input used by the price per unit of input. Total variable cost includes the payment for feed, fingerlings, fuel, chemicals, labour and interest on variable payments

Total costs (TC): It is the amount of money that is spent to obtain various levels of production. It is the expenditure incurred on the values and services in producing the commodity. In other words it is the sum total of the fixed costs and the variable costs. In the case of aquaculture the total cost of production from farm to farm differs depending on the type of management, skill, the area under production, the technology adopted etc. The total cost is categorized into fixed costs and variable costs

Costs are usually related to the quantity of the output produced. The relationships between costs and output are shown in fig: 9.1

Here costs are taken along the Y-axis and output along the X-axis. The total fixed cost (TFC) curve is parallel to the horizontal axis, which means that the fixed cost remains the same at each level of production. Total variable costs (TVC) curve begins from the origin and increases at an increasing rate and then at a decreasing rate. As production increases the input also increases which causes an increase in the variable costs. Total costs (TC) are the sum of the TFC and TVC. Thus the TC curve originates at the point where the TFC curve meets the vertical axis and runs parallel to the TVC, because the fixed costs do not vary in the short run and TC takes the similar route of TVC.

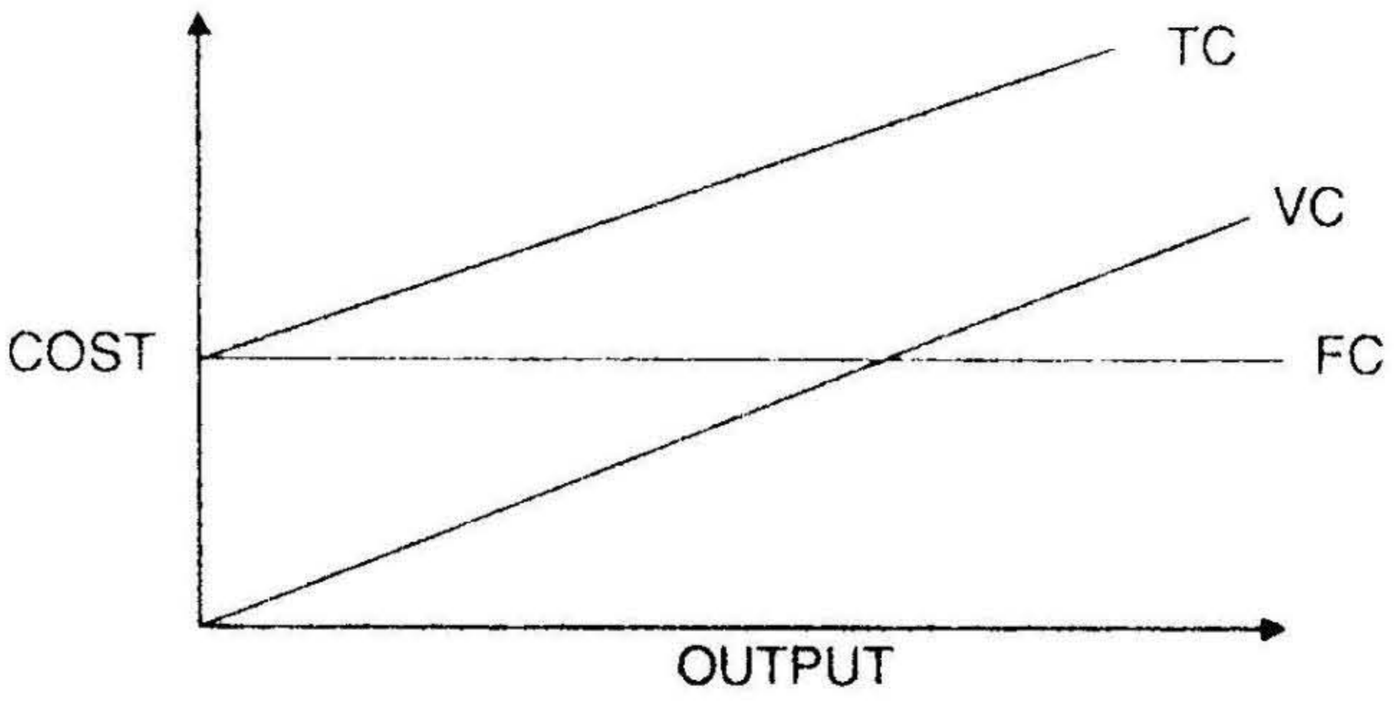


Fig.9.1 Total cost, fixed cost and variable cost curves

Average costs ®

There are three average cost curves i.e. the average total cost (ATC), the average variable cost (AVC) and the average fixed cost (AFC)

a) Average total cost

It is worked out by dividing the total cost by the amount of output or in other words, it is the sum total of AVC and AFC

$$ATC = TC/Q \qquad Q = \text{Amount of output}$$

Or

$$ATC = AVC + AFC$$

b) Average variable cost

It is worked out by dividing total variable cost by the amount of output

$$AVC = TVC/Q$$

c) Average fixed cost

It is worked out by dividing the total fixed cost by the amount of output

$$AFC = TFC/Q$$

Marginal costs:

The relation ship between the cost function and output may be studied by the examination of the marginal cost curves. Marginal cost is the additional cost necessary to produce one more unit of output. MC can be determined for each additional unit of output simply by noting the change in total cost, which that unit production entails

MC = change in total cost / change in quantity

Law of diminishing returns

Law of diminishing returns states that as successive units of a variable resource are added to a fixed resource, beyond some point the extra or marginal product attributable to each additional unit of the variable resource will decline. In other words, if additional workers are applied to a given amount of capital equipment, eventually the output will rise less than in proportion to the increase in the number of the workers employed. Suppose if a farmer owns 5 ha of pond where there is some natural fish stock, the yield he gets when he is not doing the culture will be very less. But once he starts culturing scientifically the yield will be 7-8 tonnes and in the next successive cultures he will get 12, 15 tonnes etc. but further cultures will add little or nothing to the total output

Table 9.1 Different cost concepts --A hypothetical example

UNIT OF OUTPUT	TOTAL FIXED COST (TFC)	TOTAL VARIABLE COST (TVC)	TOTAL COST (TC)	AVERAGE FIXED COST (AFC)	AVERAGE VARIABLE COST (AVC)	AVERAGE TOTAL COST (ATC)	MARGINAL COST (MC)
0	60	0	60	—	—	—	—
1	60	8	68	60	8	68	8
2	60	15	75	30	7.5	37.5	7
3	60	21	81	20	7	27	6
4	60	26	86	15	6.5	21.5	5
5	60	31	91	12	6.20	18.2	5
6	60	37	97	10	6.16	16.16	6
7	60	44	104	8.57	6.28	14.85	7
8	60	52	112	7.5	6.50	14	8
9	60	61	121	6.66	6.77	13.44	9
10	60	74	134	6	7.40	13.40	13

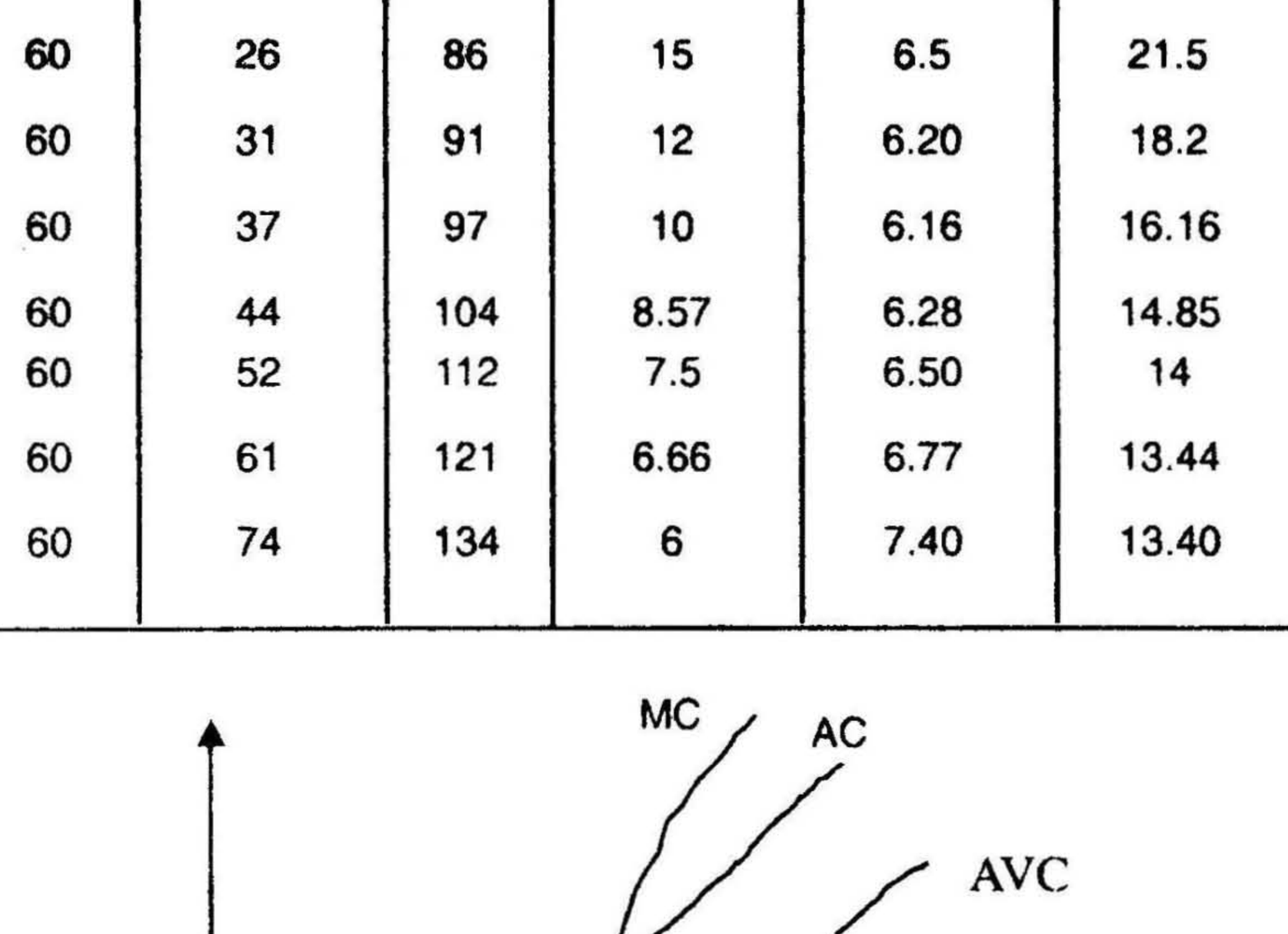


Fig 9.2 Relationship between AFC, AVC, AC and MC

From figure 9.2 we can see that the AFC curve is coming down with increase in output. This is because as the output increases, a given total fixed cost is obviously spread over a larger and larger output. AVC is obtained by dividing the total variable cost by the output. AVC declines initially, reaches a minimum and then increases. It is a U-shaped curve .It should be noted that the average cost curve will initially decrease as output increases, but eventually rises and this is attributed to the law of diminishing returns It is obvious from the figure that marginal cost curve is ultimately an upward sloping curve and the average cost curve is a U-shaped curve. Marginal costs usually depend on the nature of the production function and the unit costs of the variable inputs. As additional units of output are produced, MC falls, reaches a minimum and then rises. MC is high initially because the fixed plant or the instrument are not designed to produce very low rates of output and the production is more expensive when the output is low. MC falls because production efficiency increases as output increases up to a point, then rises because the plant becomes over utilized as output is increased. The shape of the MC is attributed to the law of diminishing returns

Relation between MC, AVC and ATC

It is notable that the MC curve cuts both the AVC and ATC at their minimum points. When the amount added to the total cost (MC) is less than the average of the total cost, ATC will fall. Conversely when the marginal cost exceeds ATC, ATC will rise. This means that so long as MC is below ATC, the latter will fall and where MC is above ATC, ATC will rise. What follows this is that the marginal cost curve must intersect the average cost curve at its minimum.

Effect of technology on cost and production

Technology and production costs are closely related. In fact the adoption of a new or an improved technology could raise the production function. It will thus shift both the marginal and physical product curves upwards under the condition that all other factors influencing supply remains the same. This effect is illustrated in the figure

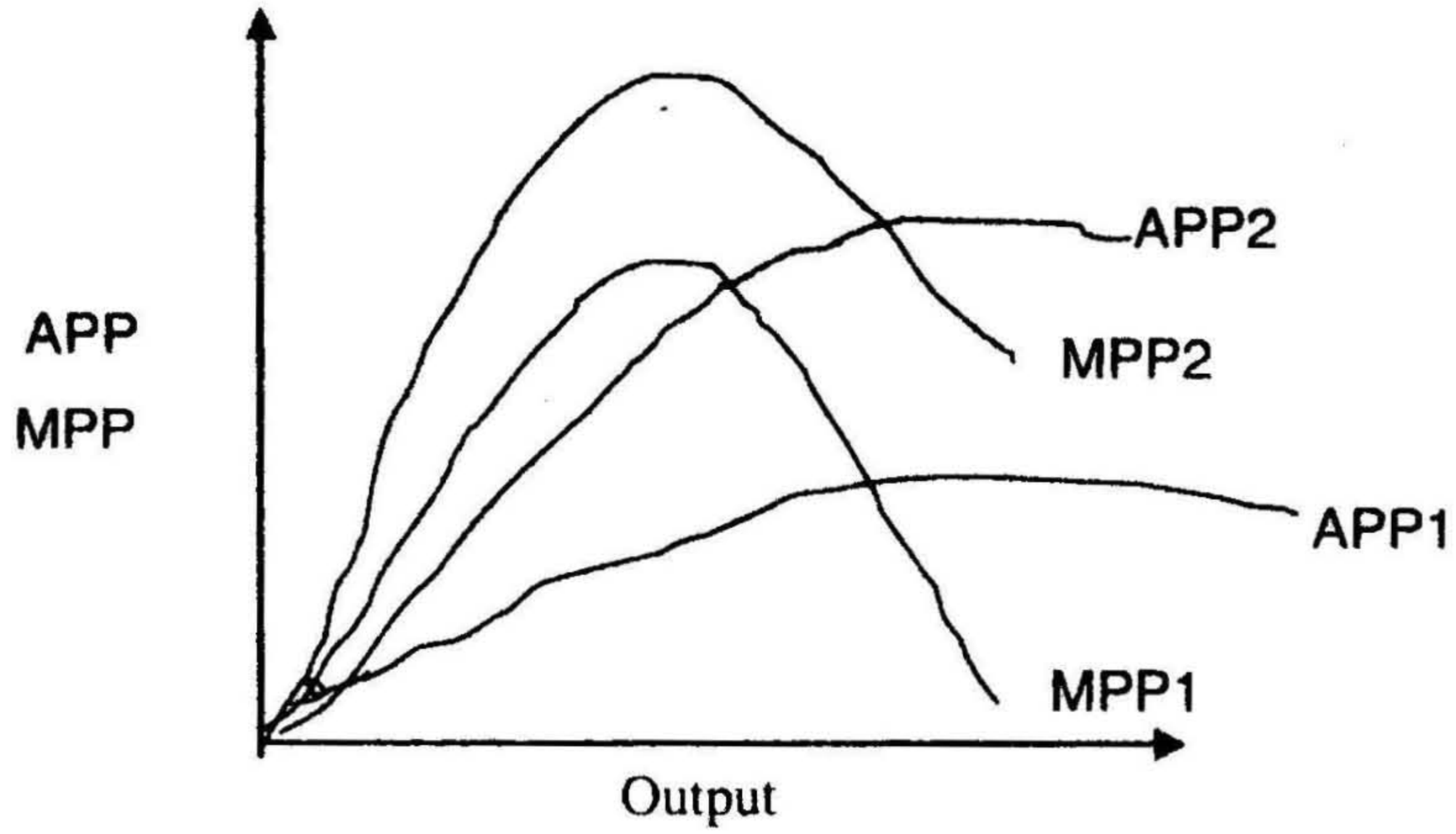


Fig.9.3 Production curves at different levels of technology

In figure 9.3, production levels APP1 and MPP1 were attainable under the existing technology. APP2 and MPP2 curve in the figure represents the hypothetical production levels obtained after the introduction of a new or improved technology. Corresponding to the APP and MPP curves there are average and marginal cost curves. This is illustrated in the following figure.

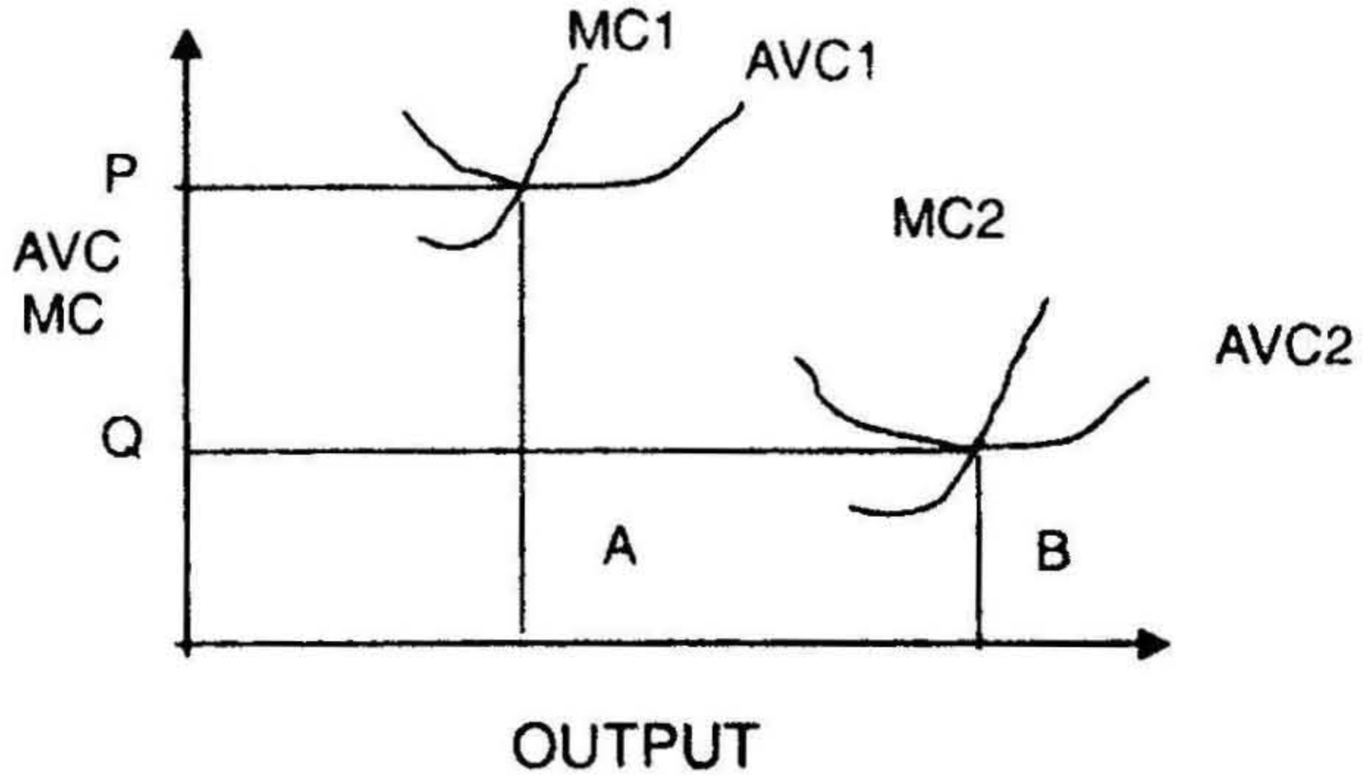


Fig 9.4 Changes in costs and output at different levels of technology

The figure indicates that under the old technology the lowest cost possible was found at the intersection of MC1 and AVC1 curves. Under the new technology, which permits increased output per unit of input, costs were reduced to MC2 and AVC2 levels. Thus the minimum cost per unit of output has declined from P to Q and the production has increased from A to B. The above will hold good under the assumption of constant factor and input prices.

Production costs in the long run

The industry and the individual firms can negotiate all the desired resource adjustments in the long run. The firm can alter its plant capacity and it can build a larger plant or revert to a smaller plant. Long run is concerned with changes in the plant capacity made by a firm. Here there is no distinction between fixed and variable costs because all resources and hence all costs are variable in nature in the long run.

Suppose a processing plant at first starts on a small scale and then expands to successively larger plant sizes

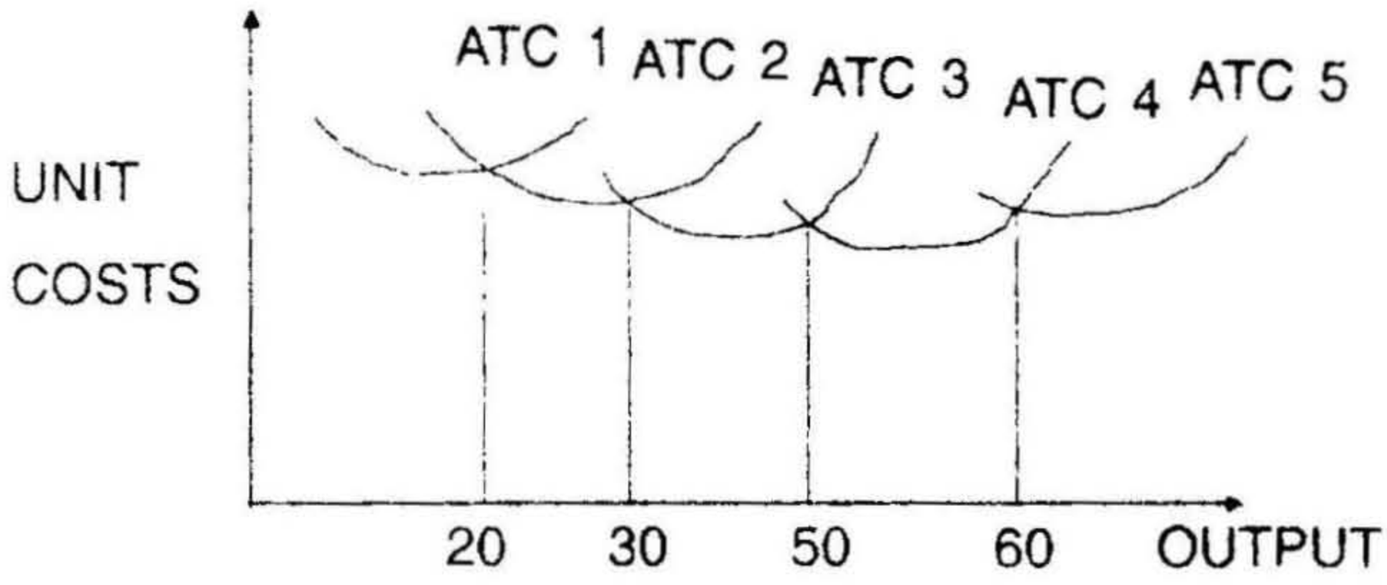


Fig 9.5 Average total costs with change in plant size

In the figure 9.5 possible plant sizes have been illustrated. ATC1 is the average total cost curve for the smallest of the 5 plants and ATC5 for the largest. The end result of having larger plant sizes is that for a time successively larger plant will bring lower average total costs. But eventually the building of a still larger plant will cause the ATC to rise. The dotted lines perpendicular to the output axis should be taken into consideration because these are the points at which the firm should change the plant size in order to realize the lowest attainable per unit costs of production. Here for all outputs up to 20 units, the lowest per unit costs are attainable with plant size 1.However if the firms volume of sales expands to some level greater than 20 but less than 30 units, it can achieve lower per unit costs by constructing a larger plant size2.

Thus it can be concluded that the long run ATC curve for any enterprise will comprise segments of the short run ATC curves for the various plant sizes, which can be constructed. The long run ATC curve shows the least per unit cost at which any output can be produced after the firm has had time to make all appropriate adjustments in its plant size. Sometimes very small changes in the volume of output will prompt appropriate changes in the size of the plant. Each point on the bumpy curve shows the least unit cost attainable for any output when the firm has had time to make all desired changes in the plant sizes. Capacity of the plant is the point where short run average costs are minimized

and is the scale of the plant that produces an output rate that provides the entrepreneur with no incentive to change the plant scale

Economies and diseconomies of scale

It is seen that for a time larger and larger plant will entail lower costs, but beyond some point successively larger plants will mean higher average total costs. The U-shaped long run average cost curve is explainable in terms of what economists call economies and diseconomies of scale

Economies of scale:

This explains the down sloping part of the long run ATC curve. As the size of the plant increases number of considerations will for a time give rise to lower average costs of production.

a) Labor specialisation:

When the size of the plant increases more number of workers are required and each of them are given specialised works. Thus workers can be used full time on those particular operations at which they have specialised skills. When allowed to concentrate on one task, the same worker may become highly efficient.

b) Managerial specialisation:

Large-scale production also permits better utilisation of resources and greater specialisation in management. The production staffs can be doubled with no increase in administrative costs. Small firms cannot utilise management specialists to best advantage. A larger scale of operations will mean that an expert can devote full time to his own work and so greater efficiency and lower unit costs are the net result

c) Efficient capital:

Small firms are not usually able to utilise the most efficient productive equipment. Only the effective utilisation of the equipment demands a high volume of production. This means that only large-scale producers are able to afford and operate efficiently the best available equipment.

d) By-products:

A large-scale producer will be in a better position to utilise the waste materials that are the by products of the processing plant.

All these technological considerations- i.e. greater specialisation in the use of labour and management. The ability to use the most efficient equipment and effective

utilisation of by products will contribute to lower unit costs for the producer who is able to expand his scale of operations.

Diseconomies of scale:

In some cases the firm may give rise to the diseconomies and so higher per unit cost. For e.g. certain managerial problems involved in the controlling and co ordination of firms operation i.e. a single person may not be able to attend to each and every aspect going on in the production process. The result of such a situation is impaired efficiency and rising average costs

Break-even analysis

It involves the study of revenue and costs of a firm in relation to its volume of sales. It indicates the volume at which the firm's costs and revenues will be equal. The break even point (BEP) may be defined as that level of sales at which the total revenues equal to the total costs and the net income will be zero. This is also known as no loss, no profit point. The main objective of the break-even analysis is to develop an understanding of the relationship of the price and volume of sales within a practical range of operation

Determination of BEP

$$BEP = \frac{\text{Fixed cost}}{\text{Contribution margin}}$$

Contribution margin = Sales - Variable cost

Break-even point may be determined either in physical units or in monetary terms.

Break even points in physical units

This method is convenient for the single product firm. The break-even volume is the number of units of the product that must be sold to earn enough revenue just to cover all the expenses i.e. the fixed costs and the variable costs. The selling price of a unit covers not only the variable cost but also leaves a margin to contribute towards the fixed cost. The BEP is reached when sufficient no: of units have been sold so that the contribution margin of the units sold is equal to the fixed cost. The formula for calculating BEP is

$$BEP = \frac{TFC}{C\ M \text{ per unit,}}$$

Where, CM = contribution margin

CM = selling price - variable cost per unit (SP - VC)

For e.g. suppose the fixed cost of a factory is Rs. 10,000/year. The variable cost

is Rs 2/unit and the selling price is Rs 4/ unit.

Then. BEP = TFC / CM = TFC / SP - VC

= 10,000 / 4 - 2 = 5000 units

This indicates that the company will not make any loss or profit at a sales volume of 5000 units as shown below

Sales / revenue = 5000 units x 4 = Rs 20,000

Variable cost = 5000 units x 2 = Rs 10,000

Total fixed cost = Rs 10,000

Total cost = VC +FC = Rs 20,000

Break-even point in terms of sales values:

The estimation of BEP of multi product firms is done in terms of value. Here also the break-even point would be the point where the contribution margin (sales value - variable cost) would be equal to the fixed cost. The contribution margin however is expressed as a ratio of sales

BEP= FC / CMR

CMR = Sales - Variable cost /sales

Break-even charts

Break-even analysis can also be presented by means of break-even charts. Such a chart can be obtained by measuring the units of products along the horizontal axis and revenue and costs along the vertical axis. This is illustrated below

Assumption:

Fixed cost - 10,000

Variable cost - Rs 2 / unit

Selling price - Rs 4 / unit

BEP = TFC /SP - VC =10000 /4 - 2 =5000 units

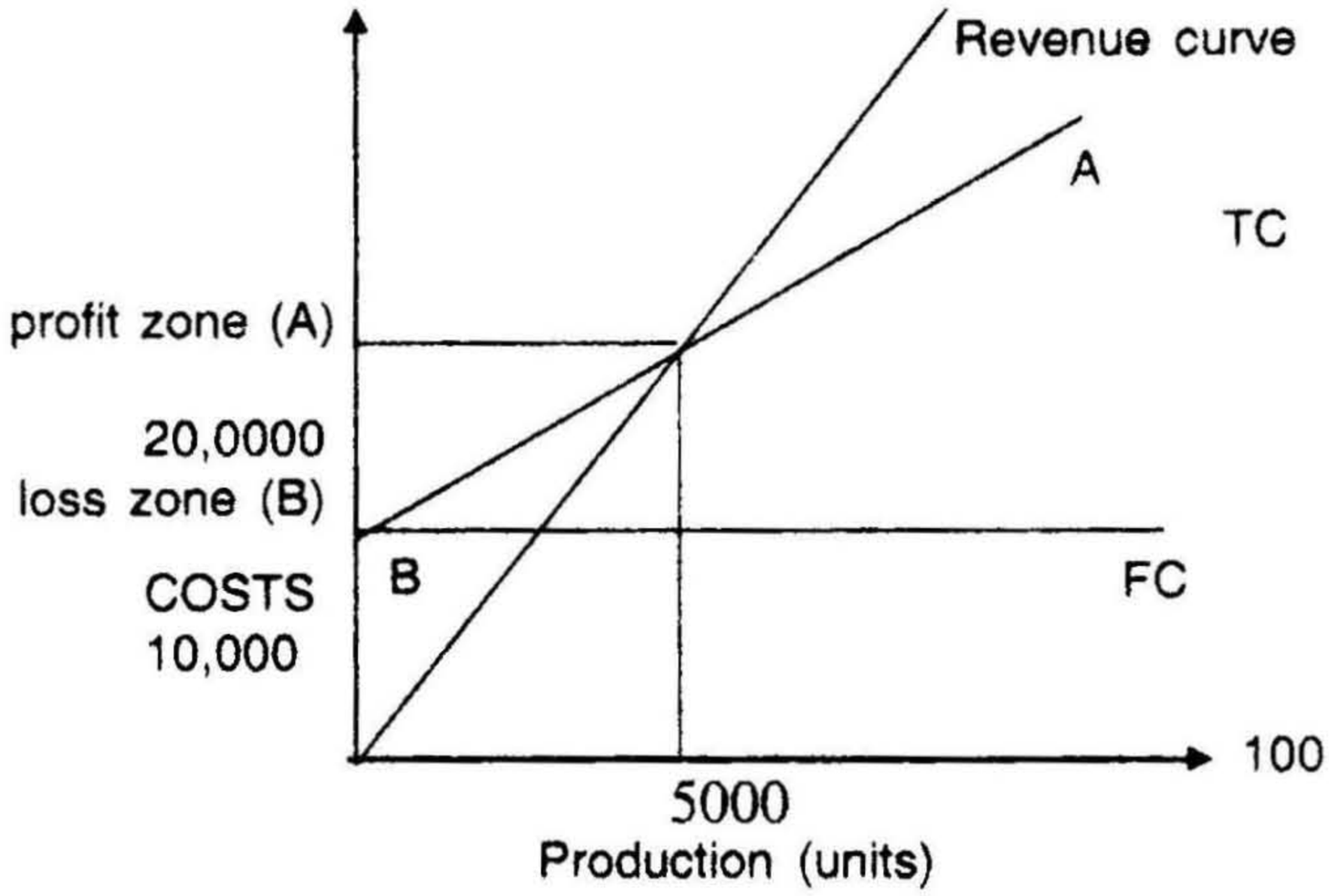


Fig 9.6 Break- even point

In the above figure a straight line parallel to the horizontal axis represents the fixed costs of Rs 10,000. TC represents the total cost curve. The vertical distance between the fixed cost and the total cost represents the variable costs. The total cost at any point is the sum total of RS 10,000 + RS 2 (variable cost / unit) multiplied by the number of units sold at that point. The total revenue at any point is the unit price of RS 4 multiplied by the number of units sold. The break-even point corresponds to the point of intersection of the total revenue and total cost lines. Projecting a perpendicular from the BEP to the horizontal axis shows the BEP in units of the product. Similarly a perpendicular from the BEP to the vertical axis shows the break even sales value in rupees.

Below the BEP total costs is more than the total revenue and the firm would suffer a loss. Above the break-even point, total revenue exceeds the total costs and the firm would be making profits. Since profit or loss occurs between cost and revenue lines, the space between them is known as the profit zone and the loss zone

E.g. A fish seed hatchery sales were Rs 2,65,000 generating a profit of Rs 35,000 in a month. In the succeeding month, the sales amount to Rs 3,32,700 generating a profit of Rs 53,850.

Determine the BEP

	I month	II month
Sales	2,65,000	3,32,700
Profit	35,000	53,850
Incremental sales	= 3,32,700 - 2,65,000	= 67,700

Incremental profit = 53,850 - 35,000 = 18,850

Variable cost = 67,700 - 18,850 = 48,850

Average variable cost = 48,850 / 67,700 = .72 /rupee of sales

Average variable cost for Rs 2,65.00 sales = 2,65,000 x .72 = 1,90,800

Profit obtained for the level of sales of Rs 2,65,000 = 35,000

Variable cost + profit = 1,90,800 + 35,000 = 225800

(Sales = fixed cost + variable cost + profit)

So fixed cost = sales - (variable cost + profit))

Here fixed cost = 2,65,000 - 2,25,800 = 39200

Contribution margin ratio (CMR) = sales - variable cost / sales

BEP = Fixed cost / Contribution margin ratio

Here CMR = 2,65,000 - 1,90,800 / 2,65,000 = .28

BEP = 39200 /. 28 = 1,40,000

So it can be concluded that when the sales of fish seed amounted to Rs 1,40,000, there was neither profit nor loss and it is the break-even point.

ABC costs and income concepts in Fisheries

Basic Concepts:

1. Cost of Production

   It is referred to as the average cost of producing unit quantity of a commodity.

2. Cost of Cultivation

   It is referred to as the average cost of cultivating unit area of land or pond

3. Fixed Cost

   It is the cost, which does not vary with the level of output.

   - Fixed capitals like land, buildings and machinery.
   - Rental values of land.
   - Interest on fixed capital excluding land
   - Depreciation

- Maintenance charges, taxes and insurance

4. Variable Cost

It is the cost, which varies with the level of output.

- Value of fingerlings, manure, fertilizers, fish feed, wages of laborer, hire charges for bullocks, machineries, in
- Interest on variable costs

ABC Cost Concepts

Cost A_1: All actual expenses in cash or kind incurred in production by the owner including interest on working capital, land revenues taxes and depreciation on implements and farm buildings

- Cost A_2: Cost A_1 + rent paid for hired in land / pond.
- Cost B_1: Cost A_1 + interest on owned fixed capital excluding land paid.
- Cost B_2: Cost B_1 + imputed rental value of owned land / pond.
- Cost C_1 (Gross cost): Cost B_1 + Imputed value of family labor.
- Cost C_2: Cost B_2 + imputed value of family labor.
- Cost C_3: Cost C_1 + transport charges of inputs.

Income concepts

Net Income	=	Total income - Cost C_1
Farm business income	=	Total income - Cost A_1
Owned farm business income	=	Total income - Cost A_2
Farm investment income	=	Net Income + Rental value of owned Pond + Interest on owned fixed capital

Example:

A farmer raises 2 crops of shrimps in two ponds of one hectare each. He owned are paid and obtained another on lease. The lease amount is 15,000 per hectare per year. The farm has own farm machines / implements worth Rs. 25,000. The depreciation rate for the fixed items is 20%. The items of cost per hectare are:

Shrimp seed	=	25,000
Urea	=	1,500
Species	=	1,500

Drugs + Chemicals	=	1,500
Family labor	=	100 man days
Family human labor	=	2,000
Labor wage	=	100 / man days
Hire charges for ploughing	=	2,500
Irrigation	=	10,000
Feed	=	1,25,000
Yield	=	2 tonnes / crop
Selling rate of Harvested shrimps	=	Rs.250 / kg
Interest rate for fixed capital	=	12%
Working capital	=	16%

Solution:

Output = 2 tonnes x 2 crops

= 4 tonnes

Value = 4,000 x 250

= 10,00,000

(i) Cost A_1 = Variable cost = 169000x 2 = 338000

$$\text{Interest on working capital} = \frac{338000}{2} \times \frac{16}{100} = 27040$$

$$\text{Depreciation} = \frac{20}{100} \times \frac{25,000}{2} = 2,500$$

= 338000+27040+2500 = 367540

(ii) Cost A_2 = Cost A_1 + rent paid for leased in land

= 367540 + 15,000 = 382540

(iii) Cost B_1 = Cost A1 + interest on capital assets excluding land

Interest on capital assets 2,50,00 x 12 1
Excluding land ——————— x — = 1,500
100 2

= 367540 + 1,500 = 369040

(iv) Cost B_2 = Cost B_1 + rental value of owned pond

= 369040 + 1,5000 (same as that of leased in pond)

= 384040

(v) Cost C1 = Cost B_1 + imputed value of family labor

= 369040 + 10,000

= 379040

(vi) Cost C2 = Cost B2 + imputed value of farm family labor

= 384040 + 10,000

= 394040

Income:

Net Income = Total income - Cost C1

= 10,00,000 - 379040

= 620960

Farm business income = Total income - Cost A1

= 10,00,000 - 367540

= 632460

Owned farm business income = Total income - Cost A2

= 10,00,000 – 382540

= 617460

Farm investment income = Net income + Rental value of owned land + interest on owned fixed capital

= 620960 + 15,000 + 1,500

= 637460

CHAPTER X

RESOURCE USE EFFICIENCY ANALYSIS

Introduction

Resource: - A supply of something that an organization or an individual has and can use, especially to increase the wealth e.g. Men, Money, Material.

Efficiency: -Ability to work well and without wasting the time or resources.

Efficiency can be related to

(1) The operation of farm business as a whole
(2) Any individual phase of the business, line of production or enterprise
(3) The use of various factors of production or resources (land, labour, capital) or
(4) To any single input (fertilizer, feeds, aerators etc.)

The study of technical efficiency as to how with the existing production technology the farmers can achieve maximum fish output without any additional cost is of vital importance to planners, administrators and research scientists. Frontier model provides adequate economic rationale for management of technical efficiency, which refers to the proper choice of production function among those actively in use by farms. Price or allocative efficiency refers to the proper choice of input combinations. Economic efficiency is a combination of technical and price or allocative efficiency. So, with technical efficiency maximum output is obtained from a given set of inputs while with allocative efficiency, for the given input prices, inputs are used in proportions, which maximize production profits.

Economic efficiency = Technical efficiency X Allocative efficiency.

Various efficiency measures, therefore, need to be developed to express technical efficiency in various farm enterprises and to relate these to the financial success.

The various farm efficiency measures can be as follows: -

(1) Physical efficiency measures (Technical efficiency)
(2) Value efficiency measures (Financial efficiency)

They can be further categorized as: -

(i) Ratio measures and
(ii) Absolute or aggregate measures

Different categories of efficiency measures are given below: -

Resource use efficiency measures

(A) Physical efficiency measures (Technical efficiency measures):

(1) Aggregate measures -Size of Business (Total area of the farm, No of culture, Total production)

(2) Ratio measures -

(a) Land use efficiency (Yield per unit area, Production efficiency, Fish Yield index, Intensity of fish culture, Percentage of Land under selected fish culture.)

(b) Labour efficiency (Fish acreage per man equivalent, Productive man- Work unit's equivalent)

(c) Machinery efficiency

(B) Financial efficiency measures:

(1) Aggregate measures (Total capital managed, Gross income, Gross expenses,Gross profit, Net worth, Net cash income, Net farm income, Farm earnings Returns to management)

(2) Ratio measures (Gross output per gross input, Fertilizer cost per fish crop ha. Feed cost per fish

Crop ha. Power & equipment cost per crop ha. Power& equipment investment Per crop ha).

Cost Ratio-

(i) Fixed cost ratio = $\frac{\text{Fixed expenses}}{\text{Gross profit}}$

(ii) Operating cost ratio = $\frac{\text{Operating expenses}}{\text{Gross profit}}$

(iii) Gross cost ratio = $\frac{\text{Total expenses}}{\text{Gross profit}}$

(iv) Cost per ha. = $\frac{\text{Total expenses}}{\text{Number of ha.}}$

Capital Ratios (capital per unit of gross profit, Capital per man), Income ratio (Rate of capital turnover, Net income per ha.), Financial solvancy's position (Net capital ratio, Working ratio, Current ratio.)

Total area of the farm

The first measures of size is the coverage of the farm, either of total land or land under culture. This is satisfactory measure for comparing a given type of land and a given type of farming. Average area per farm varies from region to region and combination of the enterprises also varies from good to poor soil and from humid to arid climate. One can consider number of standard acres under such situations and compare the size of the farm.

Land use efficiency

(i) **Yield per unit area (production efficiency):** - The production efficiency of a farm with respect to any particular enterprise can be expressed in terms of percentage as compared with average yield of the locality.

E.g. Fish yield from the monoculture of scampi in a farm per hectare = 6 tonnes

Average yield of the locality from the same = 5 ton

Production efficiency of the farm = (6 ÷ 5) x 100 = 120 percent

(iii) **Fish yield index**: - It is a measure of comparison of the yields of all type of fish crops on a given farm with average yield of these fish crops in the locality. The relationship is expressed in percentage (%). This yield index is a convenient measure because it combir,es all the yields into a single figure.

Table:10.1 : Fish yield index calculation

1.Fish culture	2. Average yield (in ton) per ha. in locality	3. Average yield in ton) per ha. In farm (x)	4. Hectare of crop in farm (x)	5. Crop yield on farm (x) as a % of locality	6. Percentage multiplied by hectares (3)/(2) x 100
Polyculture	2.5	3.0	4	120	480
Monoculture	2.0	2.4	5	120	600
Monosex culture	1.0	1.3	3	130	390
Total	-	-	12	-	1,470

$$\text{Fish Yield Index} = \frac{1,470}{12} = 122.5\%$$

(iii) **Intensity of Culture:** It measures the extent of the use of pond area for fish culture during a given year. It is expressed as a percentage.

Fish Culture intensity = (Area cultured Total culturable area) x 100.

Labour efficiency Measures:

By comparing the labour efficiency we can know whether the labour on a farm is more or less than what is required. We can also find out whether the labour is relatively more or less efficient.

(i) **Fish acreage per man equivalent**: the varying proportion of fishes with high or low labour requirements influences the significance of this measure, such as shellfish

cultured compared with finfish. It is one of the simpliest measures and is computed by dividing the total acres in farming by man equivalent

(ii) **Productive man work units per man equivalent (PMWU):** It is another good and accurate general measure of labour efficiency for all types of fish farming. This measure is computed by dividing total productive man-work units by the number of man- equivalents on the farm. For average efficiency on most of the Indian fish farms a full time worker (man equivalent) should accomplish at least 250 units per year. This measure can compare even farms in different type of farming areas with different degrees of intensity or with varying fish acreages. A productive man work unit is the average amount of work accomplished by one man in the usual 8-10 hrs. Day. The total productive man work units from a given farm represent the number of 8-10 hrs. Days required under average conditions and abilities to do all the work necessary n the production of the fish. The Productive man work units are obtained by multiplying the acres of each fish crop by the average labour requirements per unit of each enterprise in a region.

P.M.W.U.per man = Total P.M.W.U. ÷ Man equivalents

Capital efficiency:

This may be expressed in various ways. Power, machinery and equipment cost per fish crop acre. This is measure and can be calculated as given in an example below (a fish farm of 50 acre):

1.	Interest (@10%) on power, machinery and equipment investment (20,000)	Rs.2, 000
2.	Yearly repair costs (machinery& equipment)	Rs.1,000
3.	Yearly depreciation allowance	Rs.2,000
4.	Fuel and lubricant costs (yearly)	Rs.1,000
5.	Feed cost (yearly)	Rs.800
6.	Yearly taxes	Rs.600
7.	Yearly insurance premium	Rs.200
8.	Yearly machinery hire	Rs.800
	Total:	Rs.8, 400

Machinery cost per fish crop acre = Total costs ÷ Total fish crop acre

= 8,400 ÷ 50 = Rs.168

Power & equipment investment per crop acre: = Total machinery investment ÷ No. Of acres = 20,000 ÷ 50 = Rs. 400

Cost ratios

Most of the ratios or efficient factors discussed upto this point is needed in the process of analysis of the record. Their purpose, in general, is to indicate a strong or

weak point in the organization or operation of the business and to call attention to the specific phases or angles of the business where greater managerial attention is needed. In addition, there are other ratios that are often used in a more general analysis. They deal with the relationship between costs and returns, relationship of capital investment to income, and the rate of activity or turnover of the capital.

Cost ratios are averages and their magnitudes reflect physical production efficiency, selection of enterprises, prices received for commodities and the expenses for the production element s. These ratios are discussed below:

(i) **Operating cost ratio:** It is the percentage which operating expenses absorb out of gross profit. It shows the proportion of total income used in (1) hiring labour (2) buying seeds, fuel, (3) Keeping equipment in operating, etc.

Operating cost ratio = Total operating cost ÷ Total profit

Improvement in operating efficiency is directly reflected in this ratio. It should be washed closely from year to year. It may also increase or decrease because income may increase or decrease due to commodity price changes.

(ii) **Overhead changes (Fixed ratio):**

Fixed expenses continue in about the same amount regardless of the current operating policy. Their relative importance in production can be expressed by a ratio determined by dividing the total fixed costs by the gross profit.

The fixed costs generally include (1) Land revenue (2) Depreciation (3) Taxes (4) Yearly insurance premium (5) Interest on total investment etc.

Over head charges ratio (Fixed ratio) = Total fixed cost per year ÷ Gross income

For a growing efficient business, the rate of increase in gross income should be faster than the rate of increase in fixed costs. The fixed cost ratio will vary with the changes both in gross profits and fixed costs. Little can be done to reduce total fixed costs within a short period but their magnitude relative to output can be reduced by expending production while holding buildings and other such over-head-capital investments constant

Cost per ha. :

Both operating and fixed costs per ha. Can be computed as

=Total costs ÷ No. Of ha.

These ratios do not vary with selling prices and income, as does the ratio of fixed or operating costs per unit of gross profits. They are somewhat meaningless when yields are intermingled in varying proportions. Only farms with similar enterprises can be compared with these ratios.

Gross (cost) Ratio:

It is a combined measure of the profit making ability of the farm. While net income express the amount by which income exceeds expenses, the gross ratio expresses the percentage of gross income consumed by expenses and is, therefore, independent of the absolute size of business. Gross income and total expenses both affect the ratio. It may be large or small depending on the level of prices as well as the amount and level of expenses. It is indicative of the profit margin for the business as a whole. At any given level of costs and prices, it can be usefully employed in the analysis of the business. The percentage of gross income absorbed by expenses also varies with the type of the farm. With this ratio, comparisons between farms should be made only when the farms are of same general organization

$$\text{Gross (cost) Ratio} = \frac{\text{Total expenses}}{\text{Gross income}}$$

Capital Ratios

Capital ratios can be also used in the analysis of the organization with respect to the resources of farm.

(1) Capital per unit of Gross Income:

Occasionally a ratio is computed to measure the total amount of capital invested per unit of gross income.

= Total capital invested ÷ Gross income.

(2) Capital per man:

The ratio of capital per man indicates the combination of resources in a general way. It is ordinarily computed by dividing the total capital by the no. Of man-year equivalents employed on the farm.

An optimum ratio will vary depending on the kind of farming and the availability of the funds. It does not adequately reflect variations, which can be possible through capital labour substitution.

(3) Rate of capital turnovers:

It is the most common measure of capital efficiency. It is the ratio of the total farm income to the farm capital (total assets).

$$\text{Rate of capital turn over} = \frac{\text{Gross income} \times 100}{\text{Total farm assets}}$$

The rate of capital turnover indicates the no. Of years required for the farm receipts (income) to equal the average farm capital. A faster turnover rate is sign of good farm business. A high rate of turnover is especially important for the beginning farmer who is

short on capital. This rate ordinarily varies widely with the type of farm investments.

Measures of Farm Income and Profit Efficiency:

There are various measures, which can be used to evaluate farm incomes and profits. The measures listed below can be useful for such an analysis.

(i) Net cash Income: Total cash receipts from production minus Total cash operating expenses.

(ii) Net Farm Income: Net cash income from production plus or minus change in inventory in non-depreciable items and depreciation on power machinery, building, etc.

(iii) Farm earnings: Net farm Income plus value of farm privilege (farm products) used in home.

(iv) Family labour earnings: Farm earnings minus interest charges on farm capital.

(v) Percent returns to capital: Ratio of farm earnings minus imputed value of the family labour to average capital investment, expressed in percent terms.

(vi) Returns to management: Family labour earnings - imputed value of the family labour.

Efficiency Measures & Business Decisions

Land uses Efficiency:

The intensity of fish farming can be compared with established standards and necessary improvements can be made to get more production. The yield per ha. And fish yield index can be compared with potentials under given conditions and the short- falls can be removed.

Labour Efficiency:

By comparing the labour efficiency, it can be figured out whether the labour is more or less than what is required on the farm. It can also be found out whether the labour is efficiently or inefficiently used and measures can be taken to improve the labour efficiency.

Capital Efficiency:

A faster turnover rate of capital is a sign of good business. The rate of turnover on a particular farm can be compared with other farms under similar conditions.

One can calculate the income measures to know the return to labour; land capital & management as all have their opportunity cost. If the actual returns were less, than the opportunity cost, the farmer would need to make necessary adjustment and increase his efficiency.

Production Function

It is one of the basic and important concepts in economics. It is the basis for resource economics studies. The production function is a technical relationship concerning inputs and outputs at a given time using existing technology.

Inputs are productive services, materials and forces used in the production process. Aquaculture inputs include Explanatory variables like stocking rates, fertilizer, feed, pesticide, labour, land, or rearing area; environmental factors like soil, pH, water salinity; management like expertize of operator; and dummy variables (e.g. for location, climate that can't be readily quantified) etc. Capture fisheries inputs include craft & gear type, craft & fish hold capacity, ice quantity, engine hp, fishing area & hours, diesel, crew member, accessory fishing aids, etc.

Outputs are goods and services resulting from the processes, which may be thought of as the sum of physical materials and forces. The output of fish is somewhat complex, and is the resultant of a wide variety of inputs. The level of output is a function of the level of each of the inputs used as well as any interaction that may occur.

A production function for fish culture may be represented algebraically as:

$Y = f(x_1, x_2, x_3, x_4, x_5, \ldots\ldots\ldots\ldots x_n)$

Where, Y = Fish output

x_1 = Amount of fish
x_2 = Stocking size of fingerlings
x_3 = Survival rate
x_4 = Stocking density
x_5 = Grow-out period
x_n = some variables related to growth

The list includes those variables that are usually considered as the most important.

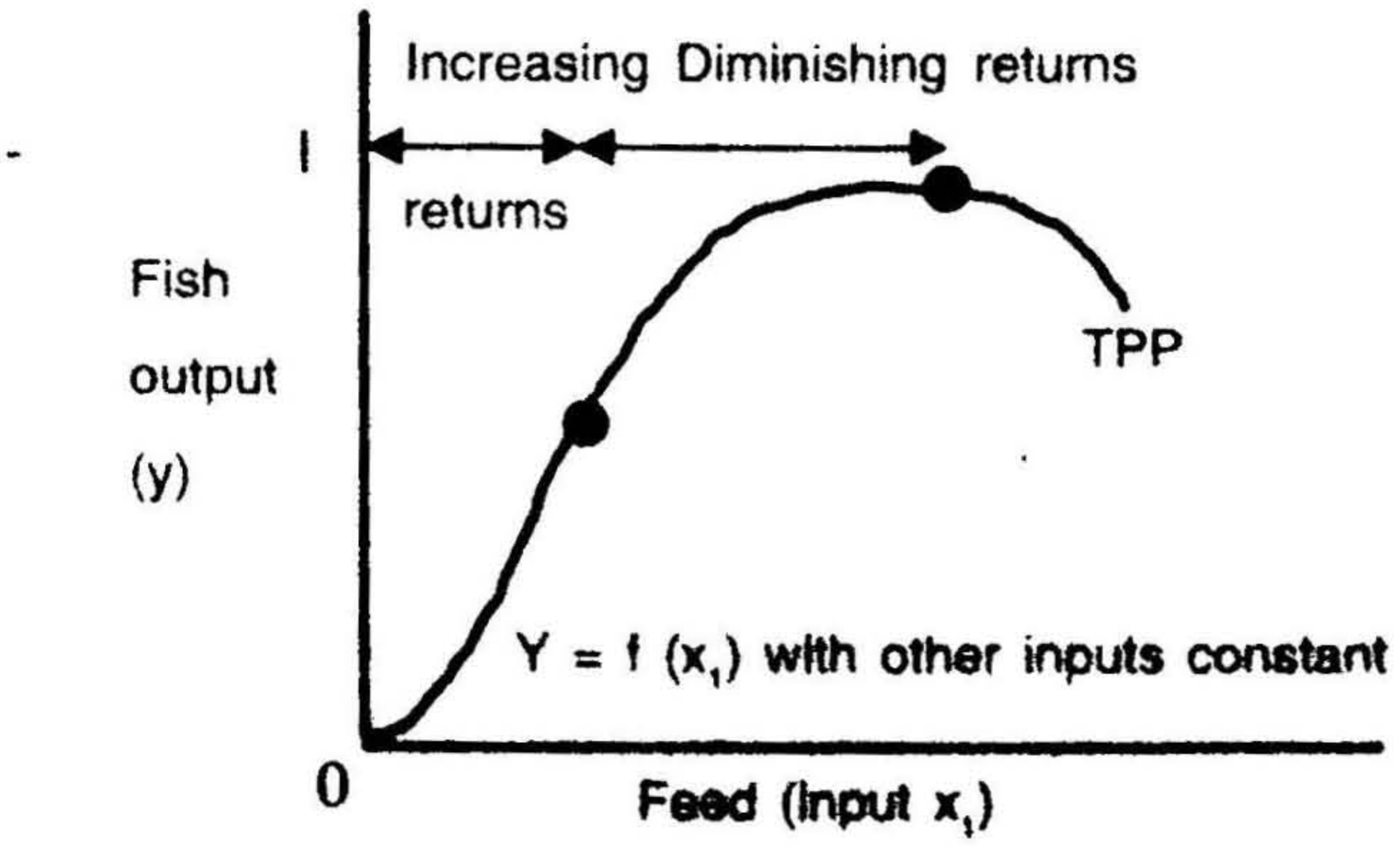


Fig10.1: Total physical production (TPP) curve when a single variable input

Production function is stated as the relationship between a single product and a single resource describing the output level observed as the level of input is varied and that relation refers to a given production period and a given technology.

Production is related to the Law of diminishing returns, which states that in the production process, and for all biological process, when a variable input factor is increased while all other factors remain fixed, production first increases at an increasing rate, then at a decreasing rate, then reaches a maximum and finally declines. Obtaining a set of observations to measure production function is not always easy. Although several functional forms like linear, quadratic, polynomial, parabolic, parametric etc. are available, we need to identify the one which best suits the data collected and our needs.

Linear production function:

This is most commonly used in linear programming models.

$Y = a + b_1x_1 + b_2x_2 + \ldots\ldots\ldots\ldots + b_nx_n$

Where, Y = Output of fish

a = constant

$b_1, b_2, \ldots\ldots$ bn = Input productivities (of respective inputs)
Productive coefficient
Or marginal product (MP)

$x_1, x_2, \ldots\ldots x_n$ = Inputs

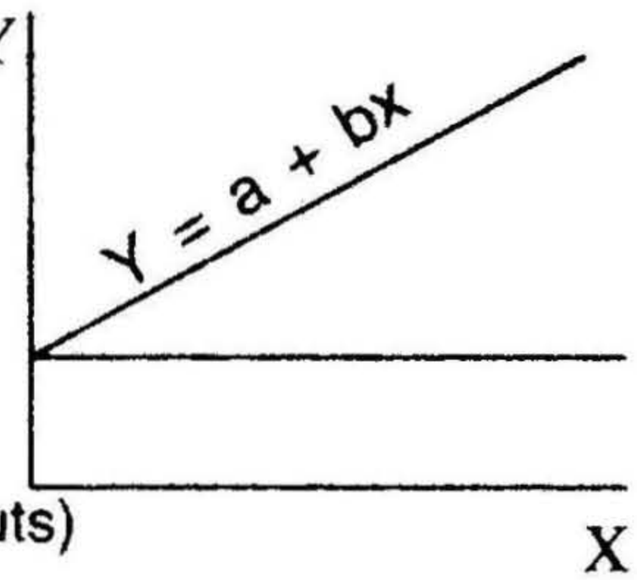


Fig10.2 : Linear production function:

<u>In fitting a simple linear production, the following six basic quantities must be obtained.</u>

n , 8 , Y , Sy^2 , Sx^2 and Sxy

n = Number of observations ; 8 , Y = Mean values of x and y

$$Sx^2 = Sx^2 - \frac{(S\,x)^2}{n}$$

$$Sy^2 = Sy^2 - \frac{(S\,y)^2}{n}$$

$$Sxy = Sxy - \frac{(S\,x)(S\,y)}{n}$$

$$b = \frac{Sxy}{Sx^2}$$, b = regression coefficient

$$a = Y + b(x - 8)$$

Cobb- Douglas (or C-D or Long Linear) Production Function:

Production economists traditionally favour this

$Y = a. X_1^{b1}. X_2^{b2}. X_3^{b3}.....X_n^{bn}$

OR (b_1, b_2, b_3.....b_n = coefficient of production of respective input)

$\log Y = \log a + b_1 \log X_1 + b_2 \log X_2 +.....+ b_n \log X_n$

The C-D function, which is linear in its logarithmic form, has several advantages that have made it attractive. (1) The elasticities of production, which measure the responsiveness of output to increased units of input, are identitical to the production coefficients ($b_{1, 2, 3}...._n$). Consequently, a percentage change in output that is brought about by a given percentage change in input use can be easily determined. (2) Input and output data can readily be used without aggregation to estimate the parameters of the model.

Let us consider a hypothetical example of a C-D production function :

Table 10.2: Example of C-D production function

Variable	Mean value	Price (Rs.)
X_1 = stocking rate (thousands/ha.)	5	1200.00
X_2 = Feed (bags/ha.)	6	1000.00
X_3 = labour (man-days/ha.)	9	80.00
Y = Fish output (Kg/ha.)	367	80.00

The mean value for output (367kg/ha.) is calculated by substituting the mean input values into the production function and solving for Y.

Table10.3: Hypothetical Cobb-Douglas production function.

$Y = 50 \quad X_1^{0.3} \quad X_2^{0.2} \quad X_3^{0.5}$			$R^2 = 0.8$; F= 35.00*
$\log Y = \log 50 + 0.3 \log X_1 + 0.2 \log X_2 + 0.5 \log X_3$			
s.e	(0.10)	(0.05)	(0.30)
t = bi /s.e	3.00*	4.00*	1.67
Output elasticities	0.3	0.2	0.5
Economies of state = S bi = 0.3 + 0.2 + 0.5 ≒ 1.0			

X_1 = stocking rate, X_2 = feed, X_3 = labour, Y = output of fish.

*Significant at 1% level.

In table, coefficient of determination $R^2 = 0.8$ (R = correlation co-efficient), therefore, 80% of the variation in output is explained by the three independent variables. All co-efficients (bi) have the expected positive sign. The co-efficients of two of them (X_1 & X_2) are

significantly different from the zero (0) at the 1% level according to the t-test ($H_0:b_1 = 0$, $H_0:b_2 = 0$ are rejected ; $H_0:b_3 = 0$ is not rejected). The co-efficient of the last input (x_3) is not significantly different from the zero (0). The output or production elasticities are 0.3, 0.2,and 0.5 respectively. A 10% increase in input (x1), for instance, will produce a 3% increase in output, and so on. Because the sum of the co-efficients equal 1.0, unitary economies of sale exist, a doubling of all three inputs will double output.

Are producers, on average, economically efficient? That means is their use of inputs optimal in terms of maximizing their profits? To answer this question it is necessary to calculate th3e marginal physical product each of the variable inputs and compare it with the input-output ratio.

$$MPPx_1 \begin{matrix} > \\ \\ < \end{matrix} \frac{Px_1}{Py}$$

If MPP (Marginal physical product) is greater than the price ratio, use of the input should be increased (i.e. there has been under use of inputs). If MPP is less than the price ratio, use of that input should be reduced (i.e. there has been over use of inputs). Equality implies producers, on average, are economically efficient. To calculate the MPP of each input from the production function, partial differentiation is used with all variables except the one being differentiated, entered into the production function at their geometric mean.

In the example, the MPP of input X_1, for example, would be calculated as follows:

$$Y = 50\ X_1^{0.3}\ X_2^{0.2}\ X_3^{0.5}$$

$$dY / dX = 50\ (0.3)\ X_1^{-0.7}\ X_2^{0.2}\ X_3^{0.5}$$

$$= 50\ (0.3)\ (5)^{-0.7}\ (6)^{0.2}\ (9)^{0.5}$$

$$= 50\ (0.3)\ (0.32)\ (1.43)\ (3.0) = 20.59 \text{ (MPP of input } X_1)$$

$$\text{The price ratio } Px_1 / Py = \frac{1200}{80} = 15$$

Because MPP> Px_1 / Py (e.g. 20.59 > 15), the use of input X_1 on the average farm should be increased. This can also be concluded from the fact that the value of marginal product (VMP = MPP. Py = 20.59 x 80 = Rs. 1647.20) is greater than the marginal cost (Px_1 = Rs. 1200.00) of the additional units of input. Marginal physical product (MPP) for the other two inputs would be calculated in a similar manner, and their use either increased or decreased depending upon the relationship between the MPP and the respective price ratio.

Frontier Production Function:

Frontier production function is defined as the relationship that describes the maximum possible output for the given combination of inputs. A production function

estimated by ordinary least square (OLS) method shows an average response and does not represent frontier. Farrell (1957) used a deterministic approach in which he estimated a cost frontier using Linear Programming (LP) requiring all observations to lie on or above the cost frontier. Aigner & Chu (1968) transformed the cost frontier into a production frontier.

The frontier production function is described by connecting the points of maximum output level of input and thus represents most technical efficient input-output combinations. The estimated production function, on the other hand, is as industry "average" function because it is derived by OLS methods that take into account all observed input-output combination, not only the most technical efficient. Consequently, the average production function, though describing the average aquaculture firm in the system, does not represent the maximum possible output obtainable from a set of inputs. To determine the maximum productive capacity of aquaculture systems, a frontier production function should be used.

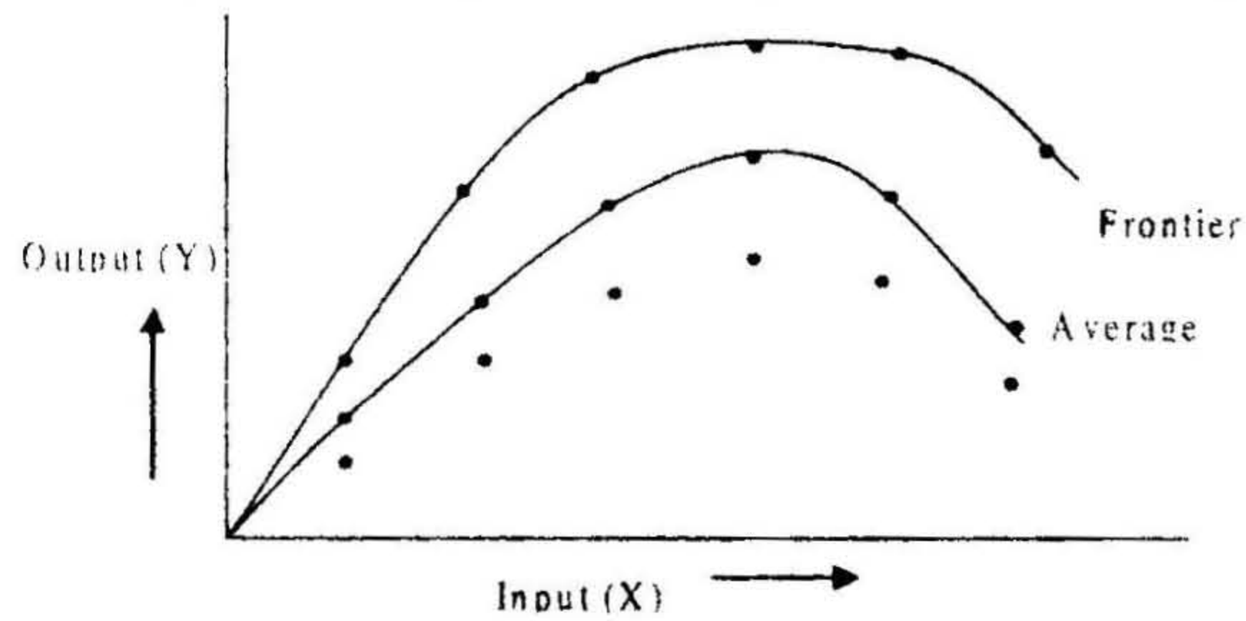


Fig 10.3 : Comparison between "frontier" and "average" production functions, single variable input case.

Technological change:

Technology refers to the available know-how of producing an output using certain inputs. Technological change means improvement in the production know-how so that the output is enhanced. It shifts the production function over some range so as to produce more output with the same quantities of inputs or to produce the same output with fewer quantities of inputs. Therefore, while, analyzing the functional relationship between the output (fish) produced, with the same inputs, say seed, feed, fertilizers, manures, etc, it is generally assumed that the technology adopted remains the same.

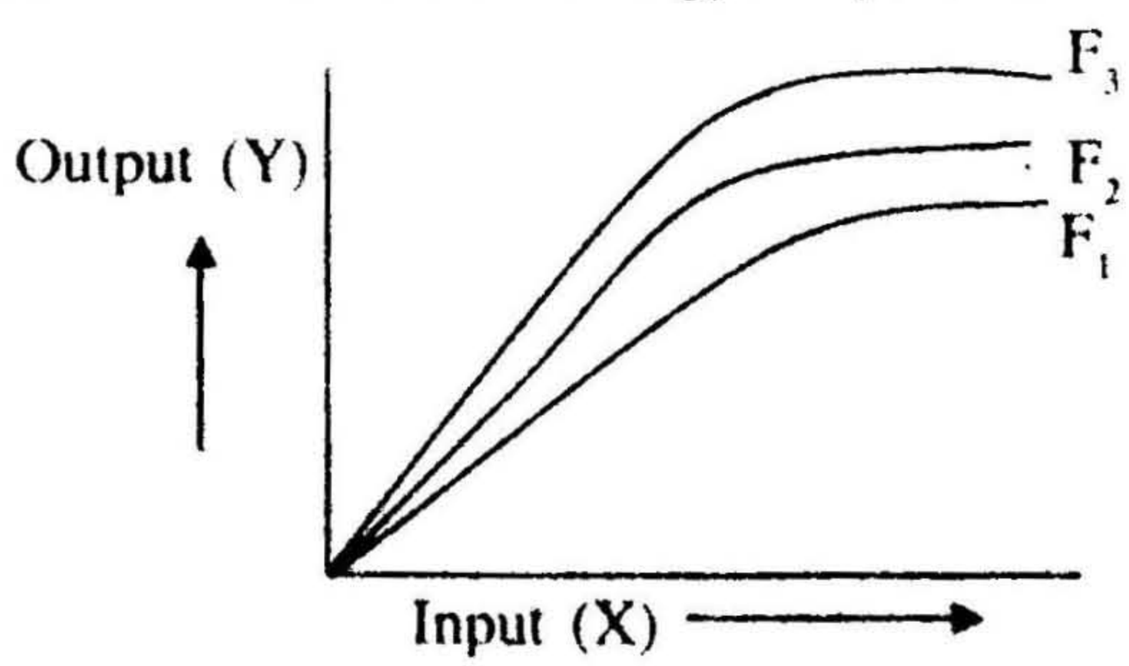


Fig10.4: Shifts in production function

Quadratic Production function:

Quadratic production function is used as the special case where all but one or two explanatory variables (various inputs) are held constant and describes a parabola, most familiar to most biologists.

$$Y = a \pm b_1X_1 \pm b_2X_2 - b_3X_1^2 - b_4X_2^2 \pm b_5X_1X_2$$

Cost Function

The cost function or the cost curve represents the functional relationship between output and total cost. It can be presented in three ways (1) arithmetically (in tabular form) (2) geometrically (in graphic form) or (3) algebraically (in equation form). We will discuss about what will happen to cost structure when we produce different quantities of fish.

The Total cost function:

The exact nature (curvature) of the total cost function depends on the nature of the corresponding production function i.e. the shape of the total cost curve is determined by the production function, provided that the price which the producer pays for inputs does not change as the quantity of inputs purchased changes.

Relationship between production function and Total cost function:

The curve TP in fig. (A) shows the relation between output and use as well as cost of input at constant prices. Since each unit of input costs the same amount, this curve is identical to the production function in which "Y" is a function of the variable input "X" in physical terms.

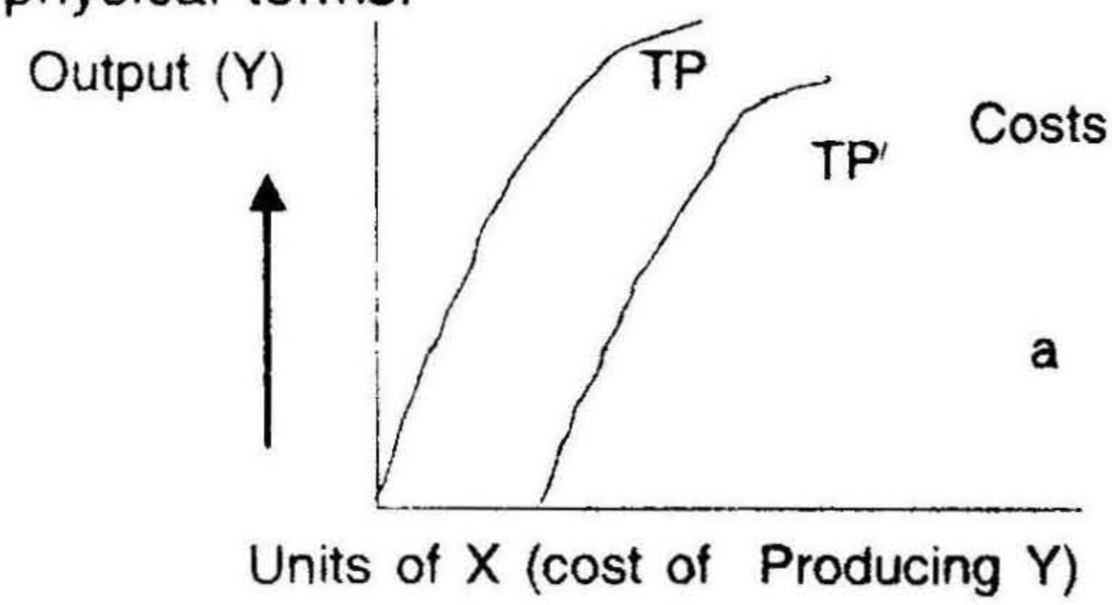


Fig10.5: output related to cost (Production functions)

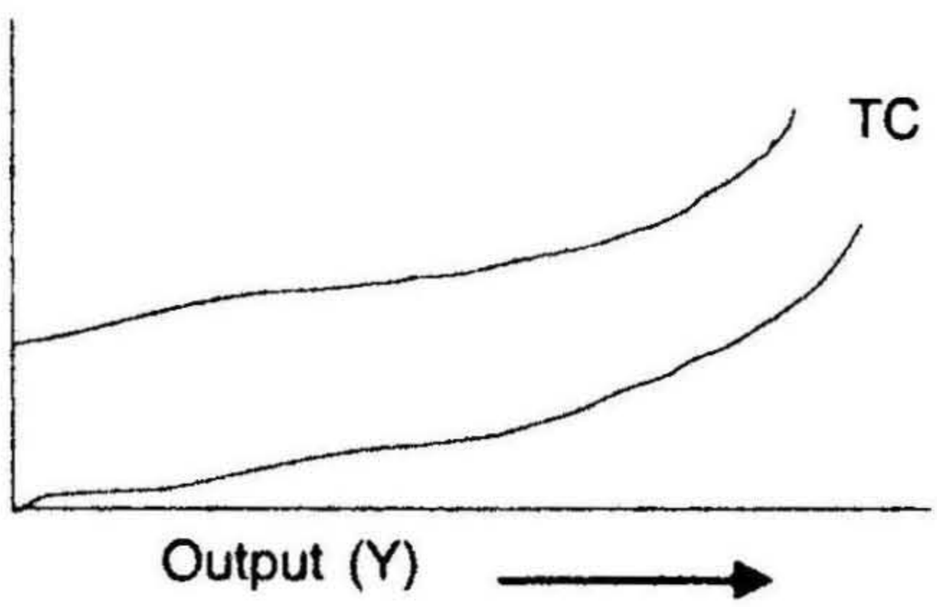


Fig10.6: Cost related to output (Cost functions)

There are also fixed costs involved in the production of "Y". Moving the production function to the right on X- axis by a distance equal to the fixed costs can show fixed costs. In this case, the amount of fixed cost is represented by the distance (a). Note that fixed costs do not change the shape of the curve only the position is affected.

When the cost is thought of as related to output, cost curve are portrayed with cost on the vertical axis and output on the horizontal axis as shown in fig (10.5B). The total cost curve in fig(10.5B) is the same curve as TP in fig(10.5A) only the graph is turned

sideways and backward. Total product curve and total cost curve are thus related in the reverse order.

There are logical reasons for expecting the total cost curve to have the general form as shown fig (10.5A). Since each additional unit of input has a cost, we would expect the total cost curve to rise throughout its entire range. Only, if the variable inputs were free, would the total cost curve go horizontal, that is, the cost will be independent of output. We would expect the average cost to fall as output increases because fixed cost will spread on more and more number of units as the output expends. Under each condition it would cost less per-unit to produce more, and consequently, the rational producer would continue to expand his production. In doing so he would continue increasing his net revenue.

On a production function of classical type we would not expect the fish farmer operating in a region in which total cost will increase as production decreases. Hence, from the viewpoint of a farm, one would expect the total cost curve to lie between the limit of a horizontal and a vertical line as does the total cost curve in fig(10.5B).

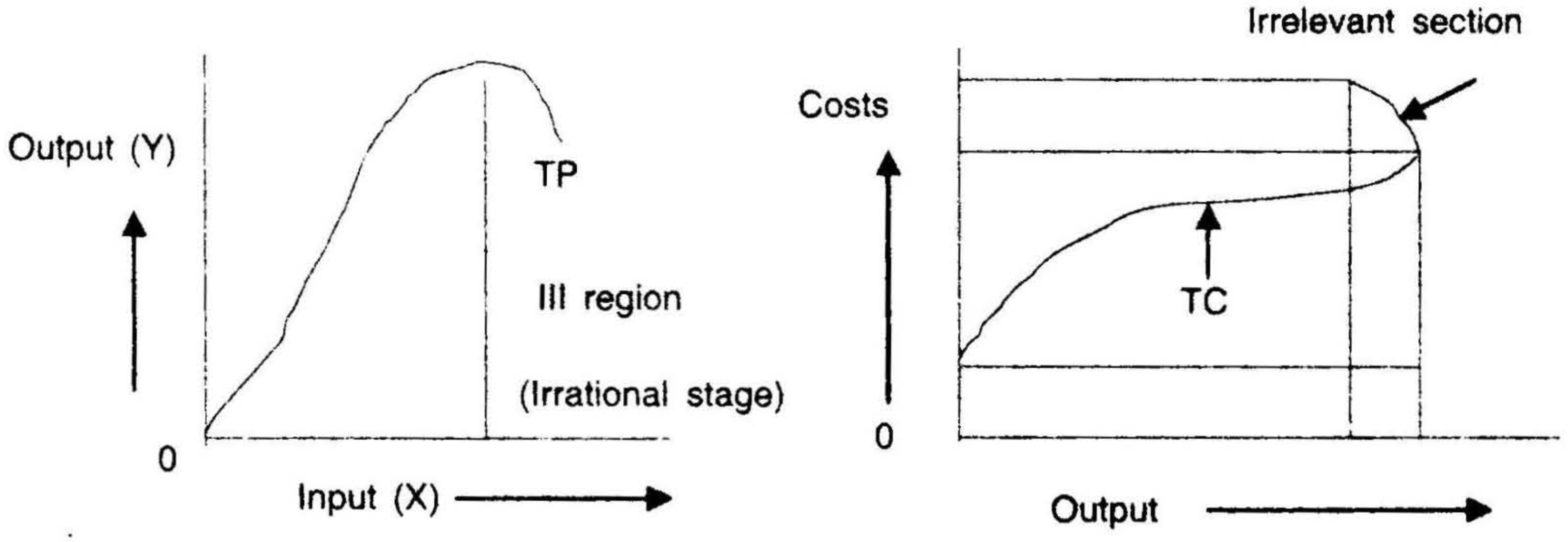


Fig10.7: Relationship between different production regions of production function and total cost function.

CHAPTER XI
ROLE OF FINANCIAL INSTITUTIONS IN FISHERIES

Introduction:

Fisheries is assuming great importance in agricultural economy of developing countries including India. In India, fisheries sector has reached commercial level from traditional artisanal level. Our export earnings through fish and fish like items have been on increase for the last two decades. This has necessitated heavy financial investments and bankers were asked to support this major area. From the time fisheries was declared as allied agricultural activity and brought under priority sector, responsibility of financial institutions to support fisheries development activity has further increased.

India's fish production during 1999-2000 is 5.65 million tons contributed by Marine and Inland sector at the ratio of 50:50. India ranks 3rd in over all fish production and 2nd in Inland fish production among fish producing countries. Marine export contributed about Rs.6443 crores to national economy in 2000, which is 23% more than last year contribution. The fisheries sector contributes about 1.28% to the total GDP and 4.12% to the GDP from Agriculture sector. The fisheries sector has grown at a pace of 6% p.a. during the 8th five-year plan. India has an estimated fish production potential of 8.4 mill tons (3.9 mill tons from marine and 4.5 mill tons from Inland sector). This potential is from the following resources. Indian coastal length 8124 kms, EEZ area is 2.01 mill. Sq.kms. Rivers and canals of 171334 km, reservoirs of 2.05 mill.ha, tanks and ponds of 2.855 mill.ha, oxbow lakes and derelict water of 0.788 mill.ha, and the brackish water resources around 1.42 mill.ha. Fisheries sector is being given emphasis as far as food security of the nation is concerned. In this development aspect comes the financial institutions, which contributed, contributes, will contribute enormously for the growth of this sector.

Broad classification of source of finance:

Financial source (either grants or loans) can be classified by the following heads;

1. Multilateral Agencies,
2. Bilateral Agencies,
3. National Governments,
4. Non-Governmental Organisations,
5. Private sectors including Community and Household resources.

Generally speaking support from both Multilateral and Bilateral agencies for agricultural and allied activities has been declining and at the same time support to NGOs is in increasing trend.

1. Multilateral grants and loans:

The two most common sources of credit for Asia's developing countries are

a. The World Bank
b. The Asian Development Bank.

a. The World Bank:

World bank loans to Asia's agricultural sector are $ 231.8 mill. in 2001.

b. Asian Development Bank:

In 1997 ADB approved 632 loans, of which 10% went to agriculture and allied sectors.

Other multilateral agencies:

a. United Nations Development Project, (UNDP)
b. United Nations Development Fund for Women, (UNIFEM)
c. United Nations International Children's Emergency Fund, (UNICEF)
d. United Nations Development Cooperation Project
e. Food and Agricultural Organization (FAO)

(Schemes;

- TCDC,
- Special Food Security Programs,
- Technical co-operation Programs.

2. Bilateral Programmes:

Bilateral institutions have in past worked with Government organizations. But as with multilateral the direction has changed toward assistance to NGOs and private sector. Bilateral Agencies provide funds for rural development including fisheries. They are

1. US Agency for International Development (USAID),
2. Australian Agency for International Development (AusAID),
3. Canadian International Development Agency (CIDA),
4. Danish International Development Agency (DANIDA),
5. Norwagien Agency for Development (NORAD),
6. GTZ (Germany),
7. GRET (Greece),
8. Belgium and Netherlands also has bilateral programs,
9. European Union Development Fund.

3. National Programs;

1. Government Financial Institution Credit Programs for Various Sectors of Rural Development. Many of these programs are unsuccessful due to
   - Complicated loaning procedures,
   - High transaction costs
   - Unrealistic repayment schedules,
   - Poor loan recovery
   - Dole-out mentality among farmers
   - Mismanagement
2. Micro financing for poor, eg. NABARD. Here the problems or constraints are
   - Many programs do not target the poorest of the poor and so the beneficiaries are non-poor.
   - Poors don't have collateral security.

4. NGOs:

As Non-Governmental Organizations work at the village level they become the Vehicle for donor agencies program implementation. They follow micro finance through Group-based Rural Finance Projects (GFPs) and Community based Resource Management Program. Some of the NGOs working in fisheries are Ramakrishna Mission, Lutheran World Service, Don bosco Society, Nehru Yuva Kendra, Kamala Nehru Trust, Tagore Rural Development Society. The important or popular project getting momentum is the SHG that is Self Help Group.

5. Private sector:

They offer assistance through commercial banks and financial institutions, they are Informal banking system such as Credit Unions, Pawnshops, Saving and Credit associations, Landlords, Moneylenders and Traders who lend money or in kind loans.

Disadvantage in this system is higher interest rate.

Community or Groups: It is becoming popular. These are community based farmer groups, village associations and cooperatives, which are sources of funds for development. Much of the fund is generated through group savings.

Household level: It includes resources in the form of labour.

As far as Indian Marine fisheries sector is concerned the access of finance goes in this order,

1. Fish merchants (Middleman),
2. Professonal moneylenders,
3. Money from relatives, chit funds or local savings,
4. Cooperative banks,
5. State finance corporations,
6. Branches of commercial banks and regional rural banks.

Reserve Bank Of India:

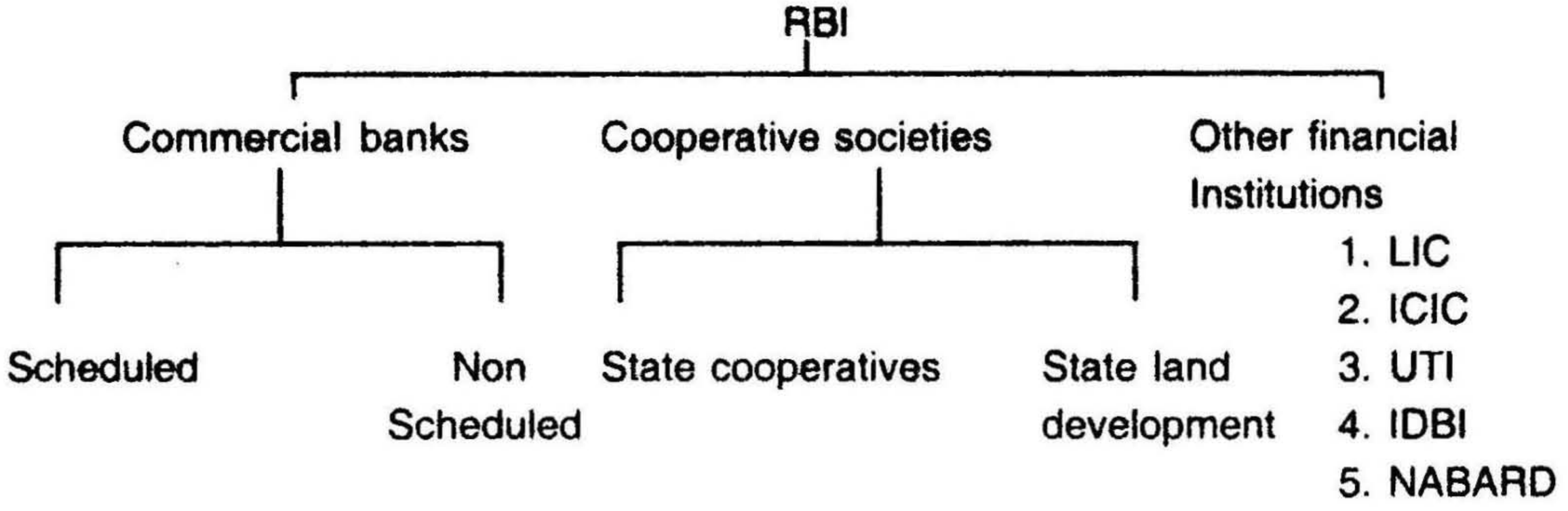
History:

India's Central Bank, the RBI was established on 1st April 1935 through Reserve Bank of India Act, 1934. RBI was nationalized on 1st January 1947. The Central office is at Mumbai. It has 22 regional offices; most of them are in state capitals.

The **hierarchy in RBI** is as follows

Central board of directors
|
Governor
|
Deputy governors
|
Executive Governors
|
Principle chief general manager
|
Chief general manager in charge
|
General managers
|
Deputy general managers
|
Assistant general manager
|
Manager
|
Assistant manager
|
Supporting staffs

Financial System Under RBI:



1. Private sector,
2. Foreign commercial banks.

Functions:

- Regulating issue of bank currency notes,
- Managing India's foreign exchange reserves,
- Operating India's currency and credit system with a view to secure monetary stability,
- Developing India's financial structure in line with socioeconomic objectives and policies,
- As bankers to the Governments, commercial banks, state cooperative banks, and some financial institutions,
- Important role in maintaining exchange value of rupee,
- Agent of government in International Monetary Fund,
- Developmental and financial functions.

Specific functions of RBIs departments:

There are various departments under RBI. The departs dealing with finance are as follows;

Urban Banks Department:

They supervise primary cooperative banks, and also do regulatory, supervisory, operational and developmental works.

Rural planning and credit departments:

They do following functions;

Monitor and facilitate flow of credit to rural agricultural and small industries sectors, Framing policies on priority sector lending, Support to NABRAD, Making allocations for contribution to rural infrastructure development fund (RIDF) amongst scheduled commercial banks, Implementing and monitoring lead bank scheme which aims at forging a coordinated approach for providing bank credit to achieve overall rural development, Setting up of local area bank, Regulator of regional rural bank, state/central cooperative banks and local area banks, Monitoring poverty alleviation schemes, Implementation of banking ombudsman.

World bank:

History:

World Bank group consist of World Bank, International Finance Corporation (IFC), Multilateral Guarantee agency (MIGA) and International Center for Settlement of Investment Disputes (ICSID).

World Bank:

The International bank for reconstruction and development (IBRD) and International development association (IDA) are collectively called as World Bank.

IBRD:

It was established in 1945, oldest and largest body Among World Bank group. 183 countries subscribed its capital. Only IMF member can become member. Subscription depends on each one's quota in IMF.

Salient feature:

- Loans only to credit worthy borrowers,
- To those projects promise high real rates of economic return,
- No reschedule of payments,
- No loss,
- Cumulative lending upto year 2001 $360 bill, in 2001 it is $ 10.5 bill. (south asia's share18%,If you see urban, its share 2%, for agriculture and environment the share is 12%.

IDP:

It was established in 1960.Membership open to all members of IBRD. Total no of member countries are 162.

Salient features:

- Assistance to only poorer (Annual per capita GDP<$696) developing countries (60 countries eligible)
- Credits to government only,
- Period 35-40 years,
- No interest (only 0.5% of loan as service charge),
- Cumulative lending upto year 2001 $127 bill, in 2001 it is $ 6.8 bill. (South Asia's share18%, If you see urban, its share 2%, for agriculture and environment the share is 12%.

IFC:

It was established in 1956.The total no of members are 175 countries.

Salient features:

- Work closely with private investors from around the world and invests in commercial enterprises in developing country,
- Provides loans and makes equity investments.

MIGA:

It was established in 1988.The total no of members are 154 countries.

Salient features:

- Promotion of investment for economic development in member countries through guarantees to foreign investors against losses caused by non-commercial risks through advisory and consultative services.
- Assist developing countries in creating responsive investment climate and information base to guide and encourage the flow capital.

ICSID:

The total no of member countries 134.The total no of cases registered in 2001 is 12.

Purpose of World Bank:

To promote economic and social progress in developing nations by helping raise productivity so that there people may live better and fuller life.

Areas of assistance:

1. Adjustment related (including rural development) sector,
2. Agriaultural/rural development sector,
3. Education,
4. Environment,
5. Industry/Energy,
6. Infrastructure/Urban development,
7. Population, health and nutrition,
8. Rehablitation/reconstruction.

Financial Allotment: Data for 2001.

Loan disbursement $ 17.3 bill.,
(IBRD-10.5 +6.8 billion.)

Loan outstanding:

IBRD — $ 120104.11 mill.
DA — $ 8664.38 mill.

Some of the World Bank assisted fisheries schemes:

1. Gujarat fisheries project ($ 38 million):

   Development of harbor at Mangalore and Veraval (Infrastrutural facilities, purchase of mechanized fishing boats and dug-out canoes)

2. Andhra Pradesh fisheries project ($ 35 million):

   Infrastructure at Kakinada, Vizag, Nizamapatnam and supply of mechanized fishing vessels and sail crafts.

3. Inland fisheries project in five inland states ($ 9.3 million):

   Fish pond development involving 117000 ha water area and construction of 27 modern fish seed hatcheries were to be developed and 14 have come up.

4. Resevoir fisheries development project.
5. IDA assisted brackish water inland fisheries project in the states of Andrapradesh, Bihar, Orissa, Utterpradesh, and West Bengal.

National Bank for Agricultural and Rural Development (NABARD)

History:

Reserve bank of India was established in 1935 with a mandate to set up agricultural credit department with expert staff. Then came Agricultural Refinance Corporation (ARC) in 1963. It was renamed as Agricultural Refinance and Development Corporation (ARDC) in 1972. Then a committee called CRAFLCARD formed in 1979 and reviewed the credit structure and recommended formation of NABARD. Then NABARD Act was passed on 12/6/1982 and NABARD was established with initial capital of Rs 100 crores.

NABARD's head quarter is at Mumbai. It has 25 regional office and one sub office. It also has 4 training establishments.

Functions:

NABARD is an apex institution accredited with all matters concerning policy, planning and operations in the field of credit for agricultura! and other economic activities in rural areas.

It is an apex refinancing agency for the institutions providing investment and production credit for promoting the various developmental activities in rural areas.

It takes measures towards institution building for improving absorptive capacity to the credit delivery system, including monitoring, formulation of rehabilitation schemes, restricting of credit institutions, training of personnel etc.

It coordinates the rural financing activities of all the institutions engaged in developmental work at the field level and maintain liaison with government of India, state government, RBI and other national level institutions concerned with policy formulation.

It provides an annual basis rural credit plans for all rural financial institutions.

It undertakes monitoring and evaluation of projects refinanced by it.

It promotes research in the field of rural banking and rural development.

They refinance to;

State Land Development Banks (SLDB),

State Cooperative Banks (SCB),

Regional Rural Banks (RRB),

Commercial Banks (CB),

Other RBI approved financial institutions.

Depending on the type of proposed project and area of operation, NABRAD refinance ranging between 75% and 95% of the total bank loan. In fisheries sector it caters to the long-term and medium term credit requirements.

Interest rate:

Earlier interest is at the rate of 6.5% to 8% for banks. Other beneficiaries have to pay a rate of 10-12.5% rate. That is small farmers 10% and others 12.5%

Now, For beneficiaries,

Up to Rs 7500 –11.5%

Rs 7500 – 25000 — 13.5%

Rs 25000 – 0.2 mill — 15%

Rs 0.2 mill & above — 16.5%

100% export oriented loan — 15%

For banks 4% less in each category

Margin money:

Small and medium farmers – 5-15% of total outlay,

Large and corporate bodies—25%

Deep sea — 25%.

Beneficiaries:

Individuals, Group of progressive entrepreneur, fishermen cooperative societies, fishermen federations, state fisheries development corporations and also private companies.

Other agencies provide credit to fisheries sector through NABARD refinance are as follows:

1. Industrial Finance Corporation of India (IFCI),
2. Industrial Development Bank of India (IDBI),
3. Shipping Credit and Investment Company of India (SCICI),
4. Industrial Credit and Investment Corporation of India (ICICI),
5. State finance corporations,
6. National Cooperative Development Corporation (NCDC),

NABARDs collaboration with other agencies:

In its effort to develop the sector in a scientific manner the bank has been actively associating itself with the regional and international agencies like Network of Aquaculture Centers in Asia-Pacific (NACA), Asian Development Bank (ADB), International Development Association (IDA), Food and Agricultural Organization of United Nations (FAO), etc. Recently NABARD has been associated in a study on aquaculture sustainability and the environment sponsored by NACA/ADB/GoI. Besides, the bank also collaborates with ICAR and other related research and development agencies on a continuing basis to remain up to date on the latest developments so as to prioritize for R&D support.

Area of financing in fisheries sector:

NABARD promotes fisheries through 3 means,

1. Refinancing support,
2. Introduction of new technologies,
3. Research and Development.

1. **Refinancing support:**

Gives financial assistance indirectly through Cooperatives, RRBs, CBs, and others. Apart from this NABARD also extends guidance to banks and entrepreneurs in formulating and implementing projects. It supplies model schemes to banks, conducts appraisal, monitoring and evaluation studies of projects.

Marine sectors:

Traditional crafts and gear – catamarans, canoes, plank built boats with nets,

Mechanized vessels like – Trawlers, Gill netters, Purse seiners, Long liners and Double rig trawlers,

Motorization- replacement of engines.

Inland sectors:

Traditional boats and nets, Carp hatchery, Composite fish farming, Integrated fish farming, (Paddy cum fish culture, Poultry cum fish culture, Piggery cum fish culture, Dairy cum fish farming, Duck cum fish culture, Plantation horticulture cum fish farming, Air breathing fish culture) Fish seed rearing, Red tilapia culture, Running water fish culture, Semi-intensive carp culture, Freshwater prawn farming, Ornamental fish breeding and rearing, Fresh water pearl culture and Cage culture.

Coastal aquaculture:

Shrimp hatchery, Shrimp farming, Brackish water fish farming, Mussel culture, Marine pearl culture, Clams culture, Mud crab culture and Cage culture.

Others:

Feed mills, Processing plants, IQF plants, Surimi production, Rural infrastructure-fishing jetties.

Future possibilities:

Finfish culture, Bivalve culture and Sea weed culture in coastal waters.

NABARD has been reviewing its policies from time to time keeping

In view the national priorities. In early eighties major share of bank finance was allotted to marine capture fisheries but latter the attention was shifted to freshwater aquaculture and setting up of hatcheries. Now with the advancement of technical knowledge and standardization of technologies, newer areas like shrimp farming, integrated fish culture projects, Mari culture etc., are being brought under the purview of institutional finance.

Cooperative banks and RRBs disburse more than 50% of credit.

2. Introduction of new technologies:

Introduction of new technologies in fisheries development in association with other developmental agencies such as state government, ICAR institutes, Agricultural Universities. Some of them are as follows;

Paddy cum fish culture, Wheat cum fish culture, Running water fish culture, Intensive carp culture with the use of aerators, Use of treated domestic and Industrial effluent for fish culture, Giant freshwater prawn culture and hatcheries, Super intensive tilapia culture. Use of partial re-circulating system, Ornamental fish breeding, Value addition through processing techniques like individual quick freezing, Cage culture in open seas, Pearl oyster culture, Sewage fed fisheries, and Mussel culture.

3. Research and Development:

To acquire new insights it is imperative that in depth studies and research are carried out. NABARD being development-oriented organization has a special fund called R & D fund for supporting year marked research projects. The main objectives of this fund is

To promote research in areas those are of primary interest to national bank,

To support research and action oriented projects in the area of rural development.

To assist and strengthen the efforts in project preparation, appraisal, monitoring and evaluation.

During 1998-99 the Bank has allotted Rs 55 lakhs in grants for research on standardization and commercialization of technologies for the fisheries sector. NABRAD also organizes seminars, conferences, and workshops for discussing strategies of fisheries development. These national conferences are attended by scientists, bankers, executives, who are all brought on common platform so that bottle necks in implementation of fishery projects can be removed and new approaches to the developments can be worked out.

Monitoring ongoing project:

In order to extend qualitative lending's and improve its performance, it is prerequisite to know the post investment development in the fields and therefore monitoring studies are conducted by NABARD in association with financing banks.

Based on pre and post investment monitoring, necessary modifications in project formulation and implementation are undertaken. Such studies are conducted taking into consideration technical, economical, commercial, managerial and social aspects.

Based on the findings of these monitoring studies guidelines are circulated.

Bay of Bengal Project (BOBP) and NABARDs role:

BOBP under FAO successfully implemented a pilot project that combined the features of commercial and development banking. These features of project implementation were taken into consideration by NABARD for its further activities.

About project:

It was carried out from 1982 to 1984 in 4 coastal districts in Orissa. Credit valued Rs 6.5 mill in the form of boats, nets, and bicycles for marketing were distributed through 29 branches of 9 national banks to 2500 fisher folk households. The loan was without any subsidy at the prevailing interest rate of 12.5% and refinanced by NABARD.

The project has set an example by establishing direct enduring links between the marine fisher folk and the banks . IT also demonstrated that bank credit to artisanal fisher folk can be viable and recoverable by achieving 95% loan repayment.

Lending operations:

Fisheries financing started almost four decades ago for small boats and nets in the marine side but for a fillip after the introduction of World Bank assisted Marine fisheries and inland fisheries programs during seventies and eighties. It reached a peak during early nineties after economic liberalization and introduction of shrimp farming. The trend of ground level disbursements in the first three years of the 9th plan indicates a growth rate of 23% during 98-99 from 97-98 and increase during 99-2000 over the previous year. The actual ground level disbursements in the first three years of the plan period are as follows;

1997-98 — Rs338 Crores,
1998-99 — Rs 443 Crores,
1999-2000 —Rs 508 Crores,
2000-2001 — Rs 584 Crores
2001-2002 — Rs 672 Crores

The schematic refinance disbursement of NABARD under fisheries sector has generally shown an increasing trend up to the year 1995-96. Subsequently, 1996-97 onwards there was decline in disbursement. The details of the schemes sanctioned and refinance disbursed in the last decade by NABARD is as follows;

Year	Rs in lakhs
1989-90	— 974
1990-91	— 1326
1991-92	— 2119
1992-93	— 3099
1993-94	— 5520
1994-95	— 10070
1995-96	— 10714
1996-97	— 4059
1997-98	— 3262
1998-99	— 2969
1999-2000	— 2683

The physical units financed and completed through NABARD assistance as on 31 march 2000 are as follows;

Mechanized boats	— 20774 nos,
Other boats	— 71004 nos,
Brakishwater aquaculture	— 4696 ha
Freshwater aquaculture	— 264000 ha

Disbursement under the fisheries sector generally showed an increasing trend until the year 1995-96. After which it was in declining phase in amount and no of loans. May be due to

- Introduction of agriculture and rural financing in large scale,
- Environmental and disease problems faced by shrimp farming,
- Initial interim order and uncertainties of the final judgment on shrimp aquaculture by Supreme Court,
- Slow progress in Mari culture,
- Mari culture disbursement not included in this report, which is, treated as separate area from 1995-96 onwards.

State wise Andrapradesh has been in the forefront of refinance disbursement. During shrimp farming crisis land locked states occupied the second and third position. In 1998-99 it is Kerala and Karnataka in 2nd and 3rd position respectively.

Problems in fisheries financing:

Fisheries has vast untapped potential for development, has good technical and scientific manpower and entrepreneurship and is also getting due priority at the national level, however, the sector is progressing as desired by planners. This due to the following constraints;

General:

- Lack of coordination among different agencies,
- Lack of extension facilities,

Marine:

- Poor Policy for deep sea,
- Lack of conservation measures,
- Lack of new vessels for various depth zones,
- Lack of good fishery infrastructure,

- Unhygienic conditions,
- Lack Processing facilities,
- Lack of marketing set-up,
- The profitability of mechanized fishing vessels has been affected due to high cost of operations especially that of diesel and spare parts
- Dependence on moneylenders by fishermen who meet their working capital.

Inland:

- Complicated Leasing policy,
- Non-availability of quality fish seed and feed,
- Non adoption of alternative species culture,
- Less contribution from reservoir fisheries,
- Ignorance of prawn farming,
- Not adopting innovative technologies,
- Lack of coordination.

Coastal aquaculture:

- Coastal regulation zone and related problems,
- Demarcation of high tide line,
- Not trying alternative species culture,
- Disease problems,
- Poor leasing policy.

Banks:

- Lack of awareness of the programs,
- Lack of coordination and monitoring,
- Lack of Insurance,
- Bad experience of banks,
- Shortage of trained staff in bank as well as implementing agency is considered a major handicap in quick processing/sanctioning of loan cases.

Remedial measures to improve fisheries finance:

1. Importance to motorization of traditional crafts,
2. More onboard, on coast facilities for handling large number of marine catches,
3. Regulated fish markets for assured fish price,
4. Incentives for diversified fishing,

5. Relief from excise duty for fund,
6. Technical and extension support to banks and FFDA,
7. Suitable leasing policy for brackish water fish culture development.

Commercial Banks:

The availability of funds from the commercial banks to the fishing industry can be divided into medium and short-term finances.

State Bank of India:

SBI has started self-liquidation financing scheme. The SBI scheme (locally known as The Ratnagiri Scheme) is one of the most popular schemes of SBI.

Other commercial banks:

The rapid progress made by the SBI induced other commercial banks also, particularly in Cochin and Bombay area. Unlike SBI these banks do not have any standard self-liquidating financing scheme but rely mainly on collateral vessel and personnel securities, comparative personal securities, comparative merits of the projects and credit of the borrowers.

Various loan schemes of commercial banks:

Pledge loan:

Pledge loans are another form of medium loans advanced by commercial banks (including SBI) to the fishing industry like any other industry. They are of different kinds such as lock and key advances, factory type advances and 'mandi' type advances at various interest rates.

Pledge loans are normally advanced for a period varying from three to five years. When perishable assets are pledged however the term is much shorter. When the loan is for the construction of processing facilities the term may be for as long as to 10 years.

Packaging credits: (Short term loans)

The short-term credit supplied by commercial banks to the fishing industry consists of packaging credits and others. Packaging credits are need based and not security oriented and is advanced normally against a letter of credit for a period upto 180 days at a particular interest rate. Packaging credits are very helpful in procuring and processing the raw materials. It is very popular among fishery processors especially at Cochin.

Other short-term credits:

Like other industries the Indian fishing industry also takes advantage of normal commercial bank shot term financing facilities in connection with purchase and collection of cheques and bills and overdrafts.

Specialized financing organization:

A large no of specialized organization have been recently set up to provide financial assistance to industrial projects. They are

Industrial Development Corporation (IDC),
Industrial Development Bank of India (IDBI),
Industrial Finance Corporation of India (IFCI),
State Finance Corporation (SFC),
Industrial Credit and Investment Corporation of India (ICICI),
Export Credit Guarantee Corporation (ECGC).

Other Institution's financial involvement in fisheries:

(During shrimp boom that is early 1990s)

Table.11.1 Schemes with financial institution

Financing institution	No of schemes	Bank loan in crores	Disbursement in crores
IDBI	11	44.28	40.47
IFCI	8	81.88	72.84
ICICI	8	72.19	66.37
SCICI	13	69.80	58.00
Commercial banks	39	27.35	23.47
Total	79	619.38	468.449

CHAPTER XII
FISHERIES CREDIT AND FINANCE

Introduction

Fisheries finance generally means studying, examining and analyzing the financial aspects pertaining to farm business, which is one of the core sectors of the country. The financial aspects include money matters relating to fisheries products and their disposal. When we speak of the financial aspects in fisheries, issues that figure are capital required for fisheries development like culture, breeding, hatcheries etc. the way necessary funds are raised and the pattern of utilization of funds so raised. Murray (1953) has defined this financial system in the following words – 'It is an economic study of borrowing funds by farmers, of the organization and operation of farm lending agencies and of societies interest in credit for fisheries (agriculture)'. Tandon and Dhondyal (1962) defined - 'It is a branch of agricultural economics which deals with the provision and management of bank service and financial resource related to individual farm unit'.

The following are implied in the above definition of fisheries finance:

- All the fish farmer should be purveyed requisite finance
- Finance should stimulate and enhance the productivity of farm scare resource and
- Farm finance has a vital and catalytic role for fishery economic development of fish farmer.

Fisheries finance is viewed both by macro and micro level. Macro finance deals with the different sources of raising funds for fisheries as a whole in economy and it is also concerned with the lending procedures of different agricultural credit institutes. Thus, macro finance pertains to financing at the aggregate level, On the other hand, micro finance refers to financial management of the individual farm business unit and it is concerned with the study as to how the individual farmer considers various sources of credit, quantum of credit to be borrowed from each sources and how he allocates the same among the alternative uses within the farm. It also concerned with future uses of funds. In sum macro finance deals with the aspects relating to total credit needs of the fisheries sector, the terms and conditions under which the credit is available and the method of using the total credit for the development of fisheries. On the contrary micro finance refers to the financial management of individual fish farm business.

Importance of fisheries finance

Fisheries farm finance plays a vital role in the socio-economic fisheries development of the country both at the micro/individual level and at the macro/ aggregate level. Its

catalytic role strengthens the farming business and augments the productivity of scare fishery resource. For instance, new potential seeds when combined with purchased inputs like fertilizers and fish protection chemicals in requisite proportions results in higher productivity in fishery resource. Application of new technological inputs obtained through farm finance helps boost fishery productivity. Accretion to new farm assets and farm supporting infrastructure provided by large scale financial investment activities entail increased farm income level, leading to overall improvement in living standards of fishermen. Farm finance can also contribute to reduction in regional economic imbalance and is equally good at narrowing down the inter-farm assets and wealth variations. To quote Muniraj (1987): 'Farm finance is the money extended to the farmers to stimulate the productivity of the limited farm resources.' It is not a mere loan or credit or advance – It is an instrument to promote the well being of society. Farm finance is not just science to manage the money, but is an applied science of allocating scarce resources to derive the optimum output. 'It is a level with forward and backward linkages to the economic development both at micro and macro level'. Thus the role of farm finance in strengthening and development of both input and output markets in fisheries is crucial and significant. Indian fisheries is still traditional subsistence in nature, hence fisheries finance is needed to create the supporting infrastructure for adoption of new technology. Here, credit system is one of the tools for the fisheries finance.

Scope of fisheries farm financial management

When we are talking to the fisheries farm financial management, we have to consider the three basic economic activities constitute the managerial process of fish farm. These are:

- Production activities
- Financial activities
- Marketing activities

Production activities

It comprise the decisions like what products to be produced in general, in specific which species to be cultured, methods of production and how much of each product should be produced.

Financial activities

They relate to the decisions of obtaining and use of credit / loans.

Marketing activities

It involves managerial decisions related to procurement of inputs and distributions and

sale of outputs. Financing decisions more often than not overlap the production and marketing decisions. For example – nature of enterprises and the quantum of the product determine the amount of capital and provide solutions to the decisions of how much capital should be used in fish farm business. Evaluation and involvement of alternatives among enterprises is linked with the decisions of how products are produced. Analogously, marketing decisions are linked with financial decisions, because product marketing and selection of input marketing are often determined by the quantum of financing. Thus, we should recognize the production, financing and marketing decisions concerned with financial acquisition and financial use depending upon the goals of financial manager. This clearly depicts the fish farm management and fish farm financial management is not altogether different, in fact the latter is a part of former. Hence the concepts, principles, analytical tools etc, which aid in the management of the farm are also applicable to the farm financial management.

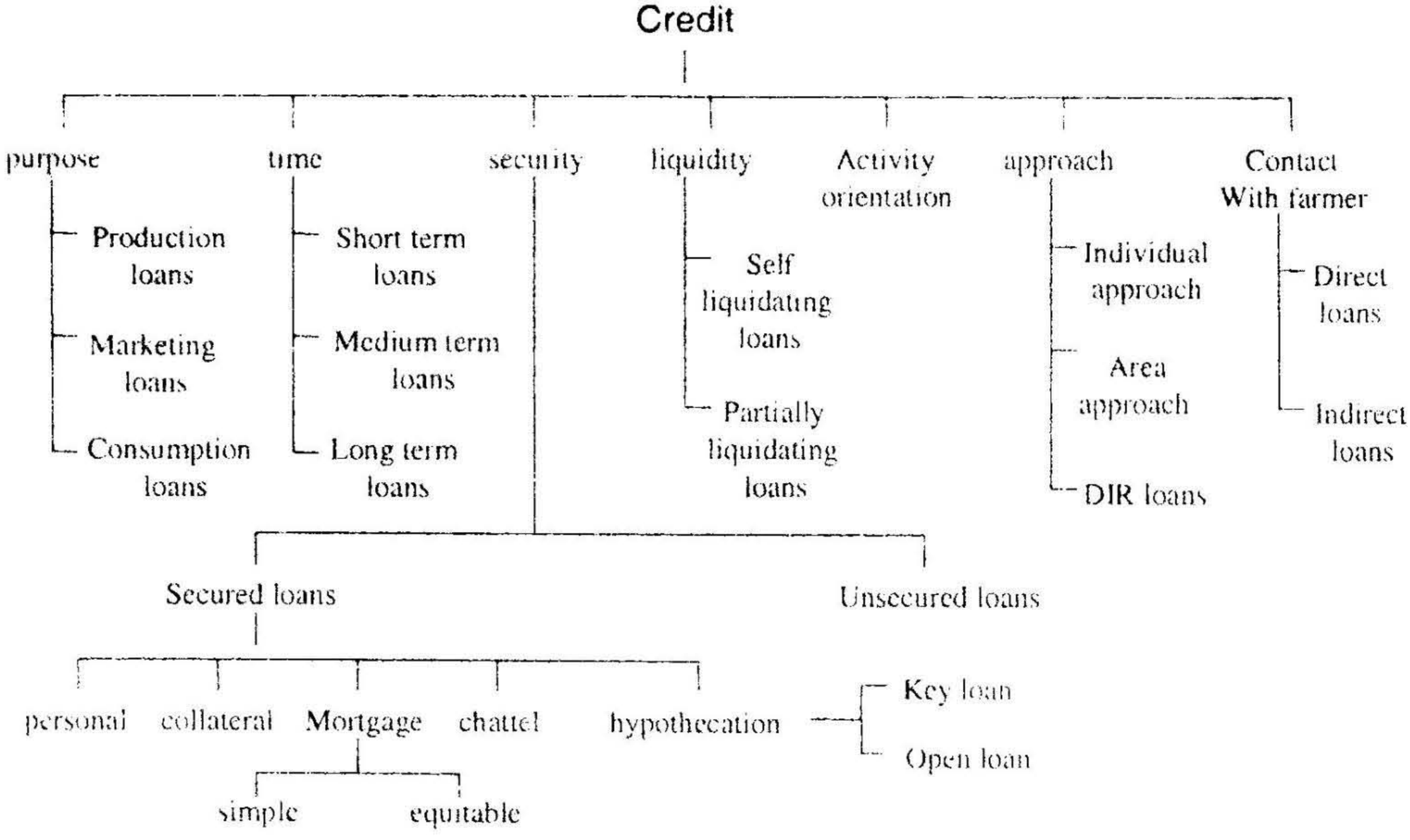


Fig 12.1. - Broad Classification of Credit System

Definition

Credit System

The Dictionary meaning of credit is 'belief that a person will keep a promise to pay' where as loan means 'something lent, money borrowed' hence, credit and loans are used synonym.

So, loans or credit can be defined as 'certain amount of money provided for certain

purpose on certain condition with some interest, which should be repaid sooner or later.

Classification of credit / loans

1. **Based on purpose:** It can be classified into three types

a) Production loans / credit: These loans / credit are intended to increase the production of the fish crops. These are also called seasonal Agricultural operation (SAR/SFO) loans or crop loans. These loans are repayable within a period ranging from 6 month to 18 months in lump sum.

b) Marketing loans: These are meant for helping the farmers to overcome distress sale and market to produce in better way, regulated markets as well as commercial banks, based on the warehouse receipt, are extending financial assistance to the farmers in this regard, by advancing 75 % of the value of the produce. This enables the farmers to clear off either loans and dispose the produce at remunerative prices.

c) Consumption loans: Any loan advanced for the purpose other than production is broadly categorized as consumption loans. It appears to be an unproductive loan, but, in fact, it indirectly assists in more production use of crop loans, and investment loan. averting to a greater extent the diversion of loans to other purposes. These are not very widely advanced and restricted to those areas, which are hit by natural calamities. These loans are granted on group guarantee basis with a maximum of three members. The loans are to be repaid within five crop seasons or two and half years whichever is less. The branch managers are vested with the discretion of sanctioning these loans up to Rs. 500 in each individual case. The rate of interest is around 11%.

The scheme is extended to:

- IRDP beneficiaries.
- Small and marginal farmers
- Landless labourers
- Rural artisans and
- Other people of very small means such as carpenters, barbers, washer man etc. who form an integral part of fishing village community.

Consumption credit is provided for the following purposes from 1976:

- Medical expenses -Rs. 500
- Expenses related to marriage -Rs. 500

- Educational needs -Rs. 250
- Birth, funerals etc. -Rs.150
- Religious ceremonies –Rs. 150
- General consumption -Rs. 150

In another system the loans based on purpose are classified also as

1. Commercial and industrial loans
2. Real estate loans
3. Loans to other banks
4. Loans to other financial institutions.
5. Loans to brokers and dealers in securities
6. Loans to farmers
7. Loans to individuals

This classification is made on the basis of the information that the bank collects on the uses of the funds requested.

2. **Based on time:** This classification is based on the repayment period of the loan component. It can be broadly classified into three categories:

a) Short-term loans: These loans are to be paid back within a period ranging from 6 month to 18 months. All crop loans are said to be short-term loans, but the length of repayment period varies according to the duration of the crop. The farmer requires this type loans to meet the expenses for the ongoing fisheries operations on the farm like water exchange, pond preparation, eradication of weeds, application of fertilizers, fish protective measures, payment of wages to casual labour etc. He is supposed to repay the loans from the sale proceeds of crop raised.

b) Medium term loans: These loans are extended for a period varying from 15 month to 5 years. These loans are required by the farmer for bringing about some improvements on his fish farm business by way of purchasing implements, electric motors like aerators, for adopting pump house etc. The relatively longer repayment of these loans is due to their partial-liquidating nature.

c) Long-term loans: These loans fall due for repayment over a long time ranging from 5 years to more than 20 years. These loans together with medium term loans are called investment loans or term loans. These loans are meant for bringing about permanent improvements on land like leveling and reclamation, construction of fish farm, building etc. Since these activities require large capital a longer period

is required for the fish farmer to repay the loan for additional returns obtained from these investment activities.

3. **Based on security:** Based on security the loan transactions between lender and borrower are basically governed by the confidence in the borrower, the question of security may not arise at all in advancing loans, but this assumption is confined to private lending to certain extent, and institutional agencies to have their own procedural formalities in credit transactions. Hence, it is imperative to classify the loans under this category into subcategories viz. secured and unsecured loans.

a) **Secured loans**: Loans advanced against some security by the borrower are termed as secured loans, various forms of securities are offered in obtaining the loan that is discussed one by one.

- **Personal security loans**: Here, borrower himself stands as the guarantor. It is advanced on the promissory note. Third party guarantee may or may not be insisted upon.

- **Collateral security loan**: It is the property that is pledged to secure a loan. The movable properties of the individual are offered as security. Examples are LIC bonds, fixed deposit bond, warehouse receipts, jewellery, machineries, livestocks etc. These are some of the properties accepted as collateral security by the institutional agencies.

- **Chattel loans**: this are specific types of loan with particular categories of lenders, loans obtained from pawnbrokers by pledging movable properties such as jewellery, utensils made of various metals etc are example.

- **Mortgage**: As against collateral security, immovable properties are presented for security purpose for example land; farm buildings etc there are two types of mortgages viz simple and equitable mortgages.

(i) **Simple mortgage**: Banking institutions, when the borrower's property is inherited from the ancestors does this. In this process the farmer-borrower has to register his property in the name of the banking institution as security for the loan obtained. This process entails registration charges to be borne by the borrower

(ii) **Equitable mortgage**: This applies to self-acquired property. In this case there is no such registration because the ownership rights are clearly specified in the title deeds in the name of farmer-borrower. Hence, documents will be obtained from the borrower as security by

the institutional agency.

- **Hypothecation**: This happens in the case of tractor loans, machineries loans like installation of PCR-lab for fisheries etc. under such loans the borrower will not have any rights to sell the equipment until the loans is cleared off. The borrower is allowed to use purchased machinery or equipment so as to enable him pay the loan installment regularly. Hypothecated loans are further categorized into two types viz. key loans and open loans.

(i) **Key loans**: The fisheries produce of the farmer-borrower will be kept under the control of the lending institutions and the loans are advanced to the farmer. As and when the loan is repaid the produce will be handed over to the farmers. Such facilities prevent the farmer from resorting to distress sales.

(ii) **Open loans**: this is another name of hypothecated loans in which the physical possession of the purchased machinery rests in the hands of the borrower, but the legal ownership rights remain with the lending institution till the loan is cleared.

(b) **Unsecured loans**: Based on the confidence between the borrower and lender the loan transaction take place. There is no mention of any type of security here.

(4) **Based on liquidity**: Under this type the loans are classified into self-liquidating loans and partially liquidating loans.

- **Self-liquidating loans**: The income generated through these loans helps the farmer to repay the entire loan amount in the same season or year of obtaining loan. The productivity increase of the loan is direct in this loan. E.g. short term loans or crop loans.

- **Partially liquidating loans or non-liquidating loans**: The income generated through the borrowings will help to pay part of the loan component only. In other words, these loans are cleared over a time period by the farmer-borrowers. These loans require relatively long time for realization of benefit. E.g. term loans

5) **Based on activity orientation**: There is no other basis except the activities for which the loans are advanced by the institutional agencies. It is more general type of classification. For e.g. if the loan is borrowed from fisheries activity it is called fisheries loan.

6) **Based on approach**: Under this we have three categories and are discussed one by one.

- Individual approach: This is advancing loans by the lending agency to any potential borrower for the purpose he needs. E.g. crop loans.
- Area approach: Here, selecting the contiguous area by a bank branch advances loans. "Service area approach" followed by the banks is an apt example.
- DIR loans: Loans are advanced to the weaker sections of the community at an interest rate of 4% per annum.

7) **Based on contact with the farmer** : Based on contact by the institutional agencies the loans are categorized into two types, viz-direct loans and indirect loans.

- Direct loans: These are advanced directly to the farmer by institutional agencies. E.g. ST loans and term loans.
- Indirect loans: The institutional agencies directly do not finance the farmers, but indirectly benefit the farmers by financing enterprises, activities. E.g. financing fertilizers manufacturing companies, financing for construction of warehouse, market yards etc.

8) **Based on the form of credit :** According to form the bank loans can be categorized into four groups.

- **Loans and advances:** In loans a bank makes an advance in lump sum, which is repaid in one single installment. Once the loan is sanctioned, the borrower is required to draw out the amount and pay interest on the whole amount sanctioned.
- **Overdraft**: An over draft is an arrangement where by the customer is allowed to overdraw his account. It is usually granted against collateral securities. Interest is charged on the exact amount overdrawn, subject to the payment of a minimum amount by way of interest.
- **Cash credit**: In the cash credit arrangement the customer is allowed to borrow up to a certain limit against either a bond of credit by one or more severities or against certain securities .The credit may be secured or unsecured, depending upon the credit standing of the party and the relationship between the bank and the borrower. Unlike the loan arrangement, the borrower in a cash credit arrangement is not bound to avail him to the whole advance sanctioned to him. With in the limit of sanction, he can draw any amount

according to the convenience. Further more, he is not obliged to draw the amount in a lump sum .The customer has to pay the interest only on the amount actually utilised by him and not on the limit granted. Another characteristic features of cash credit form of the bank loan is that the securities furnished by the borrower can be raised or reduced according to the amount withdrawned, and he is at liberty also to replace one kind of security for another till the value thereof is adequate from the bank's point of view. Cash credit is very popular in India, and accounts for about 20% of total bank finance.

Bills discounting: Loans are also given by way of discounting of bills of exchange. When a credit transaction takes place the seller draws a bill of exchange upon the buyer, requesting him to pay the amount mentioned therein after the lapse of the period of the credit. These bills are then discounted with commercial banks, which collect the payment from the acceptor of the bill on the maturity date. Banks discount only usance bills maturing within 90 days .For this service the bank charges the customer. This charge is known as discount. It include the interest for the unexpired- period of the bill for which the bank is required to retain it and compensation for the expense and trouble in realizing it. The banker may sometimes purchase bills instead of discounting them. However, this is generally done in the case of documentary bills and that too, from approved customers. Documentary bills are supported by title to good, such as bills of lading or lorry and railway receipts.

9) **According to the method of repayment:** Commercial bank loans may be classified according to the method of repayment as

- **Lump sum loans**: In lump sum loans, usually referred to as straight loans, the borrower is required to repay the entire principal amount at one final maturity date. The interest on the loan may be at various intervals, usually every six months.
- **Installment loans**: In the installment loans the borrower is required to repay the loan periodically along with the interest. Payment may be monthly, quarterly, and semiannually or annually .The installments are based on the principle of amortization by which principal interest payments are amortized over the life of the contract. The repayment schedule in this case is tailored to the income flows of the borrowers.

10) **According to the types of borrowers**: According to the types of borrowers, the bank loans can be grouped into two

- **Loans to customers**: The term customer's loan implies loans to regular deposition of the bank and is characterized by personal relationship between the bank and its depositors. In the customer's loan, the banker is under pressure to grant the reasonable requests of his customers for loans because the continued success of the bank depends upon its ability to retain the patronage of its customers. Extension and renewal of the customer's loans are common.

- **Loans to outsiders**: Loans to outsiders are impersonal, the lender who purchases the open market paper dose not anticipate the establishment of a continues debtor-creditor relationship with the borrower who offers the paper for sale by turning it over to middlemen, who in turn finds a buyer for it. When an open market loans matures. It must be paid.

Five C's of credit

Lending is the most profitable business of a commercial bank but at the same time, it is highly risky. Loans are always accompanied by the credit risk arising out of the borrowers default in repaying the money .A banker should therefore manage his loan business in profitable and safe manner .He should take all the necessary precautions to minimize the risk associated with the grant of a loan. In considering the loan proposal, he should bear in mind certain general principles of lending. These principles help him to establish some credit standards by which to evaluate the loan applications of the particular borrower's. Credit analysis involves the credit investigation of a potential customer to determine the degree of risk associated with the loan .An analysis of the credit-worthiness of the applicant, therefore, calls for a detailed investigation of the FIVE C's OF CREDIT which are listed below.

- Capacity
- Capital
- Collateral
- Character
- Condition.

Capacity

Capacity is the ability of the applicant company to meet its payables. This is related to the capacity of an individual to clear loans when they fall due. Capacity to repay is the most critical of the five factors .The prospective lender will be interested to know exactly

how he intends to repay the loan. The lender will consider the cash flow from the business, the timing of the repayment and the probability of successful repayment of the loan. Payment history on existing credit relationship personal and commercial is considered as indicator of future payment performance. Prospective lender also will want to know about the contingent source of payment.

Capital

Capital refers to the applicant's financial commitment to the business, it's the amount of equity invested in the business (or it implies availability of money with the farmer –borrowed). When the character and capacity prove to be in adequate it represents the net worth of the individual. It is an indication of the risk of the potential business. Prospective lender and investors will expect to have contribute from own assets and to have undertaken personal financial risk to establish the business .The more the personal investment more will be the commitment.

Collateral or guarantees

These are additional forms of security that can be provided the lender. While cash will nearly always be the primary source of repayment, bankers look at what they call the secondary source of payment. Collateral represents assets that the company pledges as an alternate repayment source for the loan. Collateral may takes the form of business inventory or the equipment or property the business owner is purchasing with the borrowed money. The amount on the type of collateral the lender repays will depend on the type and purpose of the loan as well as the credit history. If the business has no fixed assets to serve as collateral the lender may demand to collateralize the loan with the personal assets. Many small business loans are backed by the equity in the borrowers home. Most lenders believe that if a borrower is willing to put up own premises as collateral, he/she be more committed to repay the loan.

Character

The basis of the credit transactions is the trust, the trust the banker has on his borrower, No doubt the bank insists upon security for any loan. Even then, the element of trust has greater say in the mind of he banker before he takes a decision in considering the proposal of a prospective borrower .The confidence which the institutional agency keeps is influenced by the moral qualities like honesty, integrity, commitment, hard work, promptness and the like which the borrower exhibits. In essence it means the mental as well as moral characters of the borrower. Generally people with good mental and moral character will have good credit character.

Conditions

These are external factors that may affect the applicant's ability to pay its bills including the current state of the national and local economies, consumer's, market trends and industry trends.

Seven P's of credit

The role of financial institutions in the light of the technological changes that have been brought in on the fisheries front lies in evolving principles of farm finance which are expected to bring not only commercial gains to the banker but also social benefits. The principles thus evolved by the institutional agencies are supposed to have universal validity. These are popularly known as SEVEN P'S OF CREDIT that are listed and explained here under:

- Principles of productive purpose
- Principle of personality
- Principle of productivity
- Principle of phased disbursement
- Principle of proper utilization
- Principle of payment
- Principle of protection

Principle of productive purpose

When owned capital is a limiting factor on the farms, the credit needs of the farmers are many and varied. The requirements of credit commence right from short-term loans to term loans. This capital limitation is visible on the all farms but more pronounced on small and marginal farms. The farmers of this tiny holdings require another type of credits which the large farmers do not need i.e., the consumption loan. In the absence of consumption loans for the small and marginal farmers, the crop loans advanced may not be as productive as they are expected to be, because of their diversion for other purpose. But in spite of this known fact, the consumption credit is relegated to the back seat by the institutional agencies. When the loan is diverted for the other purposes, the productivity of the loan receives a set back and the desired results will be far cry. But the principle of productive purpose says that loan disbursed to any borrower should be capable of generating incremental income . The short-term loans of the small and marginal farmers can be made productive, if they are provided with other income augmenting assets through term loans .The income generated from these productive assets will add to the income obtained from farming .In this process, these term loans

not only turn out to be productive assets but also helps in enhancing the productivity of crop loans. To cite some of assets for which term loans are required are fisheries, dairy animals, sheep and goat. poultry. installation of pump sets on group actions etc.

Principle of personality

Over years of experience in lending, the bankers have identified an important factor in credit transactions i.e., the trustworthiness of the borrower. It has relevance to personality of the individual when the farmer–borrower fails to repay the loan in the event of natural calamities, this is the case of non-willful default i.e., not by his own fault, but by the natural forces that influence farming, which are beyond the control of human beings. But a large farmer who profitably uses the loan and still falls in the category of defaulters means, this is a case of shear willful default. This character is born out of the dishonesty of the individual when this habit becomes perpetual with large farmers who borrow substantial funds; the very functioning of the institutional business gets crippled. Thus, the safety element of the loan is not totally dependent upon the security of the loan alone. But also on the personality character of the borrower .The growth and progress of the lending institutions have dependence on this major influencing factor i.e., personality. The personality of the individual and growth of the financial institutions thus are inter-linked.

Principle of productivity

This principle stresses that the credit, which is advanced is not just meant for increasing production from that enterprise alone. But should be able to increase the productivity of the other factors employed in the enterprise. For example for taking up any enterprise we need resources (factors of production), but the resource productivity (marginal value productivity) of the factors employed exhibit a varying trend among the enterprise chosen. For example choosing integrated farming which gives relatively high returns than the usual monoculture practices. Here what we understand is that our decisions of varietal preference in crops, better competing crops and superior breeds, not only increase the returns by themselves, but also augment the productivity of the other complimentary factors employed in the respective production activities .The main concern here is that since we are using scarce borrowed capital resources no leaf should be left unturned in realizing as much productivity as possible from each resource employed. Thus this principle is centered on the point of making the resources as productive as possible by choosing the most appropriate enterprises.

4. **Principle of phased disbursement**

Ensuring the end use of the funds is the most vital aspect of institutional lendings.

No enterprise or investment activity needs all the required funds at a time and the funds requirements is spread over a period of time .In farming the need for capital is felt over five or six months for different operations like pond preparation, fertilization etc. require an altogether different time schedule. Relevant to this situation the principle of phased disbursement underlines that the loan amount need to be distributed in phases or spells to make it productive and the banker can also make doubly sure about the end use of the borrowed funds. This procedure holds good in perennial crops and investment activities. Where the phased disbursal of the loan helps to overcome the misuse or diversion of funds, but the demerit of this system is that it will make the cost on the higher side.

Principle of proper utilization

Proper utilization implies using the borrowed funds for the purpose for which they have been advanced. It sounds pretty good because every banker by heart and soul wishes this particular aspect for the mutual benefit. This to certain extent depends upon the climate prevailing in the rural areas. Explaining this a bit further, this means whether the farmers are getting the type of the resources they need at the right time and in right quantities. Are the resources like seeds, fertilizers, feeds etc. free from adulteration to guarantee the farmer to take full advantage of their use? Whether the technical advice is available with regard to production problems that crop up from time to time? Whether infrastructural facilities like storage, transportation, and marketing are available? Is the price stability in existence to help the farmer plan the cropping pattern for effective use of funds? Proper utilization of funds is possible, when the suitable conditions for investment of funds exist.

Principle of payment

This principle deals with the fixing of repayment schedules of the loans advanced by the institutional agencies .As far as the investment credit is concerned say pumps etc. the annual repayments are fixed over a given number of years depending upon the incremental returns that are supposed to be obtained after duly accounting for consumption needs of the farmers with reference to the crop loans (barring perennial crops) the loan is to be repaid in lump sum because he gets the output only once. Whenever the crop fails due to unfavorable weather conditions .The repayment is not insisted upon immediately and the repayment period is extended besides assisting the farmer with another fresh loan to enable him carry on the farm business.

Principle of protection

In view of unforeseen calamities striking farming more often than not, banks cannot abstain themselves from extending loans to the farmers. Instead what they do is that they

demand the security for the advances they make, otherwise the over dues resulting due to non-payment of loans by the farmers owing to the natural calamities affect the recycling of bank funds adversely. To tide over the situation of this nature. The institutional agencies resort to safety measures via

- Insurance coverage
- Linking credit with marketing or tie up arrangement
- Provision of finance on production of warehouse receipt.
- Covering credit under small loan guarantee scheme of deposit insurance and credit guarantee corporation of India
- Taking securities

Insurance coverage

- The loans for poultry, diary, piggery, fish farming, irrigation structures etc. are ensured. Suppose any eventuality breaks out and bring colossal load to the farmers, it is beyond their capacity to repay the loan. More so if the affected happen to belong to small and marginal categories under such situations, the insurance agencies is required to estimate the losses and indemnity is paid to the farmer, from which recover their dues.

Linking credit with marketing or tie-up arrangements

By linking credit with marketing the banker is quite safe in recovering the loan. Let us take the hypothetical example of an aqua culturist who borrows loan from the bank but supplies his whole lot to a registered marketing unit .The marketing unit is made aware of the loan of the farmer by the bank. Then the unit will not pay the entire amount to the farmer but deducts the loan component and the balance is paid. . The loan amount so deducted will be credited to the bank against the loan amount taken by the farmer by linking credit with marketing the banker is quite safe in recovering the loan.

Provision of finance against the storage receipt

When the prevailing product prices are not acceptable to the farmers they need not submit the situation. They can store the produce in the warehouse and based on the warehouse receipt. The financial institution advances loans to the extent of 75% of the value of the produce .It is a symbiotic process wherein the bank can recover loans and the farmers can derive price benefits when they sell after the glut period.

Credit guarantees

- When the banks fail to recover the loans advanced to the weaker sections. Deposit insurance and credit guarantee corporation of India (DICGC) reimburses the loans to them.

Taking sureties

- The banks advance loans either by hypothecation of assets.

Procedural formalities in sanction of farm loan

The technological break-through, which revolutionized Indian fisheries, made it capital-intensive. In our country most of the farmers are capital-starved necessitating the institutional agencies to provide the needed capital base through credit. The farmers need the credit at right time from the right agencies to derive maximum productivity out of it. This is from the farmer's point of view. In the view of the bankers on the other hand, when a farmer approaches an institutional agency with a proposal for a loan, the banker should be convinced about the economic viability of the proposed investment. In this connection some guidelines are essential for the banker to ponder over, for each investment activity is different from other in terms of productivity.

The financing bank is vested with the powers either to accept or reject the farmer's loan application. This is a sequel to an objective appraisal of farm credit proposals and procedures and formalities followed in the processing of loans. Here an attempt is made to explain the set of procedures and formalities required in processing of a farm loan application. The processing procedure is detailed under the following sub-heads.

- Interview with the farmer
- Submission of loan application by the farmer
- Scrutiny of records
- Visit to the farmer's field before sanction of loan
- Criteria for loan eligibility
- Sanction of loan
- Submission of requisite documents
- Disbursement of loan
- Post-credit follow-up measures and
- Recovery of loan.

Interview with the farmer

A banker studies the farmer-borrower in the interview regarding his credit characteristics such as honesty, integrity, frankness, progressive thinking, indebtedness, repayment capacity etc. The banker explains to the farmer the terms and conditions under which the loan is going to be sanctioned. Interview helps the banker to understand the genuine credit needs of the farmer. So interview is more than a mere formality, as it facilitates the banker to study the farmer in detail and assess his credit requirement.

Submission of loan application by the farmer

After getting satisfied with the credentials of the farmer, the banker gives a loan application form to him. Details regarding the location of the farm, purpose of the loan, cost of the scheme, credit requirements, farm budget, financial statements, etc as required in the form are filled in by the farmer. Certificates which indicates ownership of land or title deeds and Adangal (statement showing cropping pattern adopted by the farmer-borrower), farm map, no objection certificate from the co-operatives, non-encumbrance certificate from Sub Registrar of Land Assurances, affidavit from the borrower regarding his non-mortgage of land elsewhere are appended to the loan application. A passport size photograph is affixed to the loan application form.

Scrutiny of records

The bank officials with village karanami or village revenue officials verify the ownership and extent of land as indicated in the relevant certificates.

Visit to the farmer's fields before sanction of loan

After verifying the record the field officer of the bank pays a visit to the farm to verify the particulars given by the farmer. The pre-sanction visit is expected to help the banker to identify the farmer and guarantor, locate the boundaries of land as per the map and assess the marginal capacity of the farmer in farming and allied enterprises and the farmer's attitude towards latest technology. Details on economics of crop and livestock enterprises feasibilities for implementing proposed plans; farmer's loan position with the non-institutional sources is ascertained in the pre-sanction visit. Thus, pre-sanction visit of bank officials is very important to verify credit-worthiness and trust worthiness of the farmer borrower. While appraising different types of loans, different aspects should be verified. For example, to advance loan for pond digging, the location of proposed pond, ground water availability, distances from the nearly well, rainfall, command area of the pond etc are verified in the pre-sanction visit. Similarly, for other loans, the pertinent aspects are verified. All these aspects are included in the report submitted to the Branch

-Manager for taking up final decision in the sanction of the loan.

Criteria for loan eligibility

The following aspects are considered in judging the eligibility of a farmer-borrower to receive loan.

(a) He should have sound character and financial integrity.

(b) His dealings with friends, neighbours, financial institutions etc must be proper (he should not be a defaulter in the past).

(c) He must have progressive outlook and be receptive to modern technology.

(d) He should sincerely implement the proposed scheme and ensure proper use of credit.

(e) The security provided by the farmer must be free from any sort of encumbrance and litigation.

Sanction of loan

After examining all the aspects presented in the pre-sanction farm inspection report, the Branch Manager takes a decision whether to sanction the loan or not. Before sanctioning the Branch Manager considers the technical feasibility, economic feasibility and bankability of proposed projects including the repayment capacity, risk bearing ability and sureties by the farmer-borrower. If the loan amount is beyond the sanctioning power of the Branch Manager, it is forwarded to the Regional Manager or head office of the bank incorporating his recommendations. The authorities at the respective offices take the final decision on the proposed projects and communicate their decision to the Branch Manager for the further action.

Submission of requisite documents

After sanctioning the stipulated amount to the farmer-borrower the following documents are obtained.

- Demand promissory note
- Deed of hypothecation
- Guarantor letter
- Installment letter
- Authorization letter regarding the payment of loan from the marketing agencies or intermediaries on behalf of the farmer and
- Mortgage deeds

The legal officer of the bank and his opinion with regard to deeds, marketable, examines title deeds and unlitigated title is sought

Simple mortgage is followed in the case of acquired property and equitable mortgage or registered mortgage in respect of ancestral property. However, the opinion of the bank's legal officer is obtained in this regard. Mortgage of land is done prior to obtaining non-encumbrance certificate and sanction of loan.

Disbursement of loan

As soon as the execution is completed the amount is credited to the borrower's account. The loan amount is disbursed in a phased manner, that too after ensuring that the loan is used by the farmer-borrower properly. A realistic repayment plan is framed and given to the farmer keeping in view the income flow of the proposed project.

Post-credit follow-up measures

The Branch Manager or Fisheries Officer pays a visit to the farmer to ascertain the proper use of the credit. This also benefits the farmer, for they can get the technical advice if any needed from the Fisheries Officer in the implementation of the scheme. These visits are also meant for developing a close rapport between the farmer and the banker. These visits are more informal than formal, which are supposed to inculcate the feeling of friendliness and under laying the obligation of the farmer to repay the loan when it falls due such visits facilities in assessing any further requirement of supplementary credit to complete the scheme.

Recovery of loan

The bank reminds the farmer-banker in advance about the repayment of loan in time. If needed recovery camps, special drives, village meetings etc are organized at an appropriate time. All appropriate measures are taken to persuade the farmer-borrower to repay the loan in time. In the case of failure, the reasons for the same are ascertained to find out whether the borrower is a deliberate defaulter or not. If the reasons are genuine, the borrower is further helped by extending finance to accelerate farm production. In such situations a closer supervision is necessary. If the bank officials find that the borrowers are willful defaulters stringent measures are initiated to recover the loans through court of law. In all possible cases the bank officers make tie-up arrangements, i.e., the recovery of the loan is linked with marketing. Re-phasing of repayment plan is allowed in the case of justifiable cases.

Repayment plans

For term loans, which are characterised by partially liquidating nature the loan repayment plan is not as similar as that of short-term loans. These loans are recovered through a given number of installments depending upon the nature of asset and the amount advanced for the asset in question various repayment plans in vogue are listed and briefly explained here.

1. Straight - end payment plan or single repayment plan or lump sum repayment plan
2. Partial repayment plan
3. Amortised repayment plan
   (a) Amortised decreasing repayment plan
   (b) Amortised even repayment plan
4. Variable repayment plan
5. Optional repayment plan and
6. Reserve repayment plan.

1. **Straight-end payment plan or single repayment plan or lump sum repayment plan**

The entire loan amount is to be cleared off after the expiry of loan period stipulated. More clearly in this method, the farmer repays the principal component at a time in lump sum when the loan matures while the interest component is paid each year.

2. **Partial repayment plan or balloon repayment plan**

The farmer is expected to settle the entire loan amount in quarterly, half yearly or annual installments (principal + interest). It implies that repayment of loan will be done partially over the year. Usually, the installment amount will be decreasing as the year pass by except in the maturity year (final year) during which the investment generate revenue for liquidation. This is also know as balloon repayment plan, as the large final payment is made at the end of the loan period following a series of small partial payments.

3. **Amortised repayment plan**

It is an extended version of partial repayment plan. Amortisation of the entire loan amount in a series of installments. Here we have two types of amortisation plans *viz.* amortised decreasing repayment plan and amortised even repayment plan.

(a) Amortised decreasing repayment plan:

In this repayment plan, the principal component remains constant over the entire

repayment period. While the interest decreases continuously with the principal amount remaining fixed and interest amount decreasing the annual installment amount decreases over the years. The advances made for the purchase of machinery is one of the suitable examples under this category. For the machinery does not demand much repairs in the initial years of loan repayment enabling the farmer to repay a large amount of installments in the initial years.

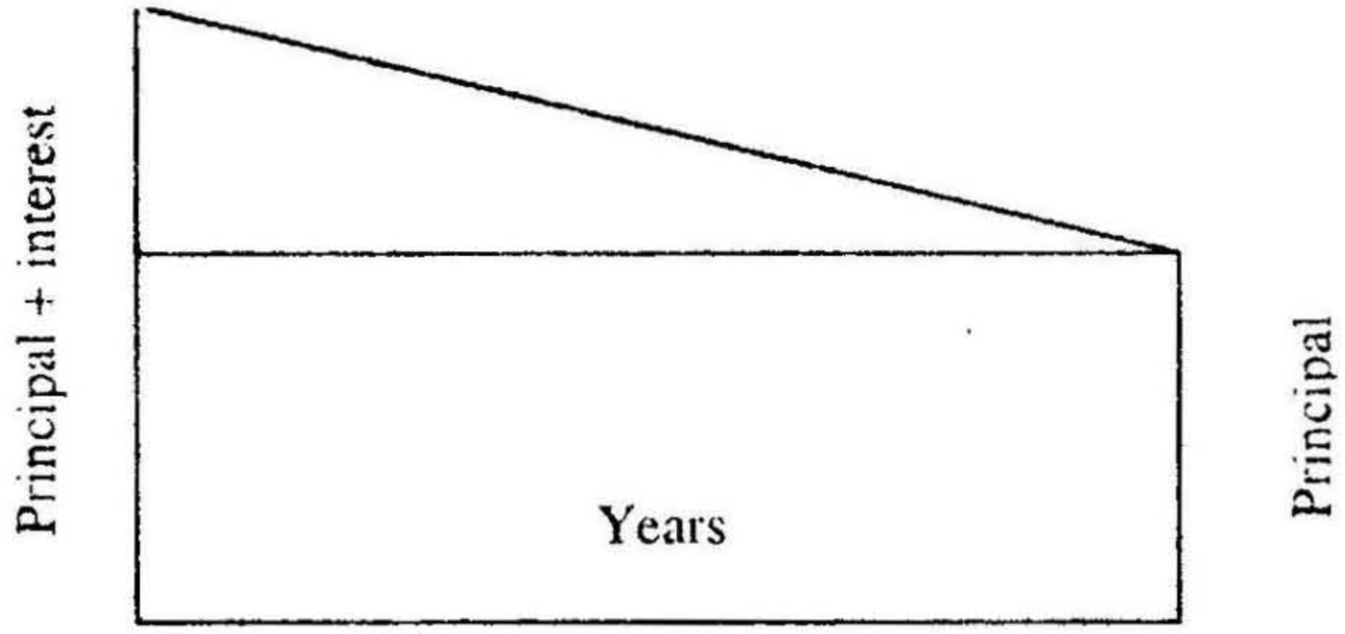


Fig.12.2.Amortised decreasing repayment plans

(b) Amortised even repayment plan:

This is called equated annual installment method. The annual installment over the entire loan period remains the same in this method. The principal portion of the installment increases continuously, while the interest part declines gradually. This method is mostly adopted for terms loans. Loans granted for farm development, digging of wells, deepening of old wells, construction of godowns, dairy, poultry etc.

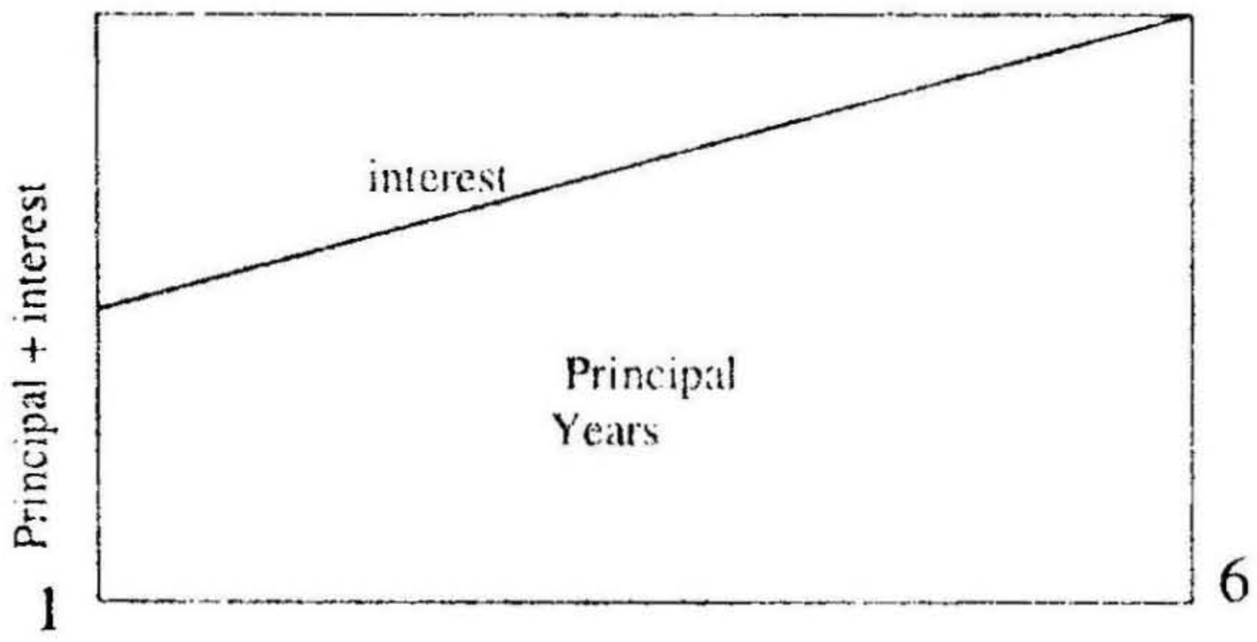


Fig.12.3.Amortised even repayment plan

The total installment is arrived through formula given below:

$$I = B \frac{I}{1 - (1+i)^n}$$

Where I = annual installment in Rs.
B = principal amount borrowed in Rs.
n = loan period in years
i = annual interest rate in fraction
Or

$$I = \frac{B}{a_{\overline{n}|i}}$$

Where a = annuity in Rs.
n = period in years
i = annual interest rate in fraction.

4. **Variable repayment loan**

As the very name indicates, the borrower pays various levels of installments over the loan period. In time of good harvest a higher installment is paid, while in periods of low yields lesser amount is credited towards installment to the lender. According to the convenience, the borrower efforts the repayment. This method is not found with institutional borrowings.

5. **Optional repayment plan**

In this method provision is made for the borrower to make repayment towards the principal amount in addition to the regular interest annually.

6. **Reserve repayment plan or future repayments**

This type of repayment is made by the borrowers in area, which are subject to high-income variability of farms. The impending problem here is that the farmers are haunted by the fear that they may not be able to keep up their promise of repaying crop loans or installments towards term loans at scheduled time. To overcome such situations the farmer makes advance payments of the loan realized from the savings of the previous year. The farmer is not a looser in these transactions by any means since he is paid interest at the rate charged on the loans for the advance amount credited. This type of repayment is advantageous to the banker, as the institutional agency need not worry regarding loan collection during the periods of crop failure. The farmer too gains less as he can keep up his integrity in credit transactions.

Conclusion:

Finance, plays an instrumental role in the development of fisheries. The non-availability of credit at the right time and in adequate quantity had been the impending problem in fisheries. For the sustainable development and the significant role it has to pay in the food and nutritional security, fisheries finance has to be improved. The financial institutions including NABARD and the commercial banks have a pivotal role in the development of fisheries.

CHAPTER XIII

CO-OPERATION, FISHERY CO-OPERATIVES AND RURAL DEVELOPMENT

Meaning of co-operation:

The word "Co-operation" has been derived from the Latin word "Co-operare" which means to work together, to endeavor together for some common purposes.

Origin:

The first Co-operative, known as the Equitable Pioneers Co-operative Society was established by a small group of weavers at Toadlane Rochdale (U.K) in 1844. Now Co-operative Movement is well established and known all over the world. The rules followed by Rochdale Pioneer were taken as model law, who wanted to start new organisations.

Objectives of co-operation:

Co-operation chiefly concerns itself: To promote the economic interest of the people, in accordance with the co-operative principles, to curb the monopoly to inculcate the habit of thrift, self help, co-operation and better business among the members; to provide means to promote the economic stability, social and cultural standards of members and to improve in general the living, farming and working conditions of members and to provide facilities.

Definition:

In the simple form "Co-operation" may be defined as living together working together and sharing together.

Vaikunthlal Metha:

"Co-operation is only are aspect of a vast movement which promotes voluntary association of individuals having common needs who combine together for achievement of common economic ends."

M.Darling:

"Co-operation is some thing more than a system. It is a sprit that appeals to the heart and mind. It is a religion applied to business."

H. Calvert:

"A farm of organisation where in persons voluntarily associate together as human being in a basis of equality for the promotion of the economic interest of themselves".

Herick:

Co-operation defined as the act of persons voluntarily united, of utilizing reciprocally their own forces, resources or both, under this mutual management to their common profit or loss".

Principles of co-operation:

(Principles of Co-operation as evolved by Rochdale Pioneers)

Co-operation is an association of persons, not of capital. It works on the

1. Principle of Equality.
2. Principle of Universality.
3. Principle of Democracy.
4. Principle of Equity or Distributive Justice.
5. Principle of Unity.
6. Principle of Thrift.
7. Principle of Maturity in Political and religious matters.
8. Principle of Honorary Services.
9. Principle of Liberty and Voluntarism.
10. Principle of Publicity.

Based on Rochdale, "Principles" at present are classified as:

A. Primary Principles:

1. Open membership
2. Democratic Control
3. Patronage dividends
4. Limited interest on capital

B. Secondary Principles:

1. Political and religious neutrality
2. Cash trade
3. Promotion of education

International Co-Operative Alliance (ICA) Reformulated Principles In 1995:

ICA at its centennial Congress held in September 1995 reformulated the principles seven which is followed by ICA today, the first four set out the working methods of the Co-operatives. next two state what is essential for continued progress of the movement and the last one legitimizes its existence in broader social context.

1st Principle: Voluntary and open membership:

Co-operatives are voluntary organisations, open to all persons able to use their services and willing to accept the responsibilities of membership, without gender, social, racial, political or religious discrimination.

2nd Principle: Democratic member control

Co-operatives are democratic organisations controlled by their members, who actively participate in setting their politics and making decisions. Men and women serving as elected representatives are accountable to the membership. In many primary co-operative members have equal voting rights (one member, one vote) and co-operatives at other levels are also organized in a democratic manner.

3rd Principle: Member Economic Participation

Members contribute equitably to and democratically control the capital of their co-operative. At least part of that capital is usually the common property of the co-operative. Members usually receive limited compensation, if any, on capital subscribed as a condition of membership. Members allocate surpluses for any or all of the following purposes; developing their co-operative, possibly by setting up reserves, part of which atleast would be invisible; benefiting members in preparation to that transactions with the co-operatives; and supporting other activities approved by the membership.

4th Principle: Autonomy and Independence

Co-operative is autonomous, self-help organisations controlled by their members. If they enter into agreements with other organisations, including governments or raise capital from external sources, they do so on terms that ensure democratic control by their members and maintain their co-operative autonomy.

5th Principle: Education, Training and Information

Co-operative provides education and training for their members, elected representatives, managers and employees. So they can contribute effectively to the development of their co-operatives. They inform the general public particularly young people and opinion leaders about the nature and benefits of co-operation.

6th Principle: Co-operation among Co-operatives

Co-operatives serve their members most effectively and strengthen the co-operative movement by working together through local, national, regional and international structures.

7th Principle: Concern for community

Co-operatives work for the sustainable development of their communities through policies approved by their members.

Status of Indian fishery co-operative movement:

Fisheries sector plays a strategic role in Indian economy by contributing to national income, exports, food and nutritional security and employment generation. In recent years, the development of fisheries has been considered to be an important activity because it is a powerful income and employment generator as it stimulates the growth of a number of subsidiary industries.

India has a vast fisheries resource potential. It has 2.02 million sq. km of area Exclusive Economic Zone (EEZ) adjoining a coastline of 8129 km length. Against the potential of producing 8.4 million tonnes of fish per annum based on the maximum sustainable yield levels from both the inland and marine fishery resources, the present level of production is 5.26 million tonnes.

Rural development in India for many years to come will be primarily agricultural development, since more than 67 per cent of our rural people still depend on agriculture. Co-operations are not an end in itself but a means to achieve a goal; to achieve economic and social growth. The Co-operative movement in India began in the first decade of the 20th century. The future of our Co-operative movement is to nurture and promote grass root level Co-operative organizations such as Fishery Co-operatives, wherever appropriate in all the spears of Agriculture.

Programmes for fisheries development

Under the Indian Constitution, the subject of Fisheries (Inland fisheries and marine fishing within territorial waters) comes under State List and hence fisheries development is a state subject. However, fisheries and fishing beyond territorial waters and fisheries research and education are in the Union list. The State Governments are being assisted by the Central Government in attaining increased production and productivity by supplementing and complementing the efforts of the State Governments. A number of programmes for development of fisheries in India have been taken up by the government of India either directly of through State Governments.

One of the strategies for the development of inland fisheries has been propagation of intensive aquaculture in tanks and ponds through the Fish Farmer's Development Agencies (FFDAs). Most of these FFDAs operate at district level while some function at

region/state level. The Agencies select suitable water areas, arrange lease on long term basis to identified beneficiaries, provide assistance for construction of new ponds, renovation of ponds and tanks, establishing running water fish culture, inputs, setting up of seed hatcheries, besides training to fish farmers/fishermen and giving them extension support.

Thirty-seven brackish water Fish Farmer's Development Agencies (BFDAs) have been established in the coastal districts of the country. The programme provides a package of technical, financial and extension support to farmers for brackish water shrimp farming.

Welfare schemes

During the last decade, welfare of fishermen was given a high priority. Not only the Group Accident Insurance Scheme was implemented covering most of the inland and marine states, but also a scheme for construction of model villages for fishermen with housing, water supply, sanitation etc., was undertaken during this period. Another component, namely Saving-cum-Relief Scheme in the welfare programme was taken up during 1991-92 under which fishermen are given financial assistance to tide over the famine conditions during the lean period of fishing operations.

Fishery cooperatives in India

Fishery cooperative movement like other cooperative movements is considered as an effective tool for the development of fishery industry and fishermen. Cooperative movement has been accepted as an important medium for generation of country's socio-economic life. The first fishery co-operative society was organized in Maharashtra in 1913 followed by the states of erstwhile composite states of Bengal and Madras in 1918. The societies continued to grow over the years into multi-functional units at the primary level, federations at district/regional, state and national levels.

The structure of fishery cooperatives in India today consists of one national level federation - National Federation of Fishermen's Cooperative (FISHCOPFED); state level federations, Central (District/Regional) level federations and primary level societies.

The structure of fishery cooperatives varies from state to state. These range from two-tier, three-tier, four-tier and even five-tier due to various factors lime the need felt by the societies/fishermen in the area, organisation of new tiers at time of need for specific purposes, regional requirements, and also due to political/leadership issues.

Basically, the Fishery Cooperatives were organized to meet the needs of local fishermen community. However, with the development of freshwater/ brackish water aquaculture and marine fisheries activities, the scope of fishery cooperatives has become enlarged. They are now undertaking various activities like fish production, transportation, preservation, processing, marketing etc. The cooperatives also carry out supportive activities such as credit distribution, manufacturing and supply of occupational requisites like craft and gear, ice production, fuel distribution, consumer articles distribution etc.

National Federation of Fishermen's Cooperatives (FISHCOPFED):

The (FISHCOPFED) is the only national level cooperative federation in India. The federation has been carrying on promotional activities and providing business support to its constituent organisations since its inception in the year 1980. Within this period they have taken up a number of activities, both business and promotional. Some of these are as under:

i) Organising activities for development of fishermen.

ii) Members' Education Programme through fishery cooperatives.

iii) Transfer of intermediate technology to fishermen through cooperatives.

iv) Extending support to the present set-up in organisation of training and education programme for fishery cooperatives.

v) Organising National Fisheries Conferences, Seminars, Workshops, etc, for reviewing the emerging problems of fishery cooperatives, and

vi) Technical collaboration with fishery cooperatives in Asia

Insurancie scheme

Under Government of India's Group Accident Insurance Scheme for Active fishermen, insurance cover is given to fishermen actively engaged in fishing. Fishermen are insured for Rs.25, 000/- for one year against death, permanent disability and Rs.12, 500/-for partial disability. The insurance premium of Rs.11.25 per beneficiary per year is shared on 50:50 basis by the Central Government. In the case of fishermen belonging to Union Territories, 100% premium is borne by the Government of India.

Need for credit

Credit is one of the important inputs in any developmental activity including fisheries. Fishermen, farmers and other entrepreneurs require credit for undertaking various fisheries development activities. Even for ongoing activities undertaken by Fishery Cooperative, as mentioned in one of the paragraphs of this paper, require adequate financial assistance.

Financing agencies

A number of agencies have been providing financial assistance for various projects and schemes being operated in the fishery sector. Government of India and State Government have been providing financial assistance to them under their ongoing schemes. The assistance is being utilised for development of common infrastructure, training and research institutes, landing and berthing facilities, welfare schemes/programmes etc.

Government agencies like Marine Products Export Development Authority (MPEDA), Fish Farmers Development Agencies and Brackish water Fish Farm etc. Development

Agencies provides assistance/incentives for fish/shrimp farming besides technical and extension support.

Commercial Banks, Cooperative Banks, State Financial Corporations and Shipping Credit and Investment Company of India (SCICI) also provides short medium/long term financial assistance for fish farming, shrimp/prawn farming, fishing boats, nets, deep sea fishing vessels, etc.

National Bank for Agriculture and Rural Development (NABARD) and National Cooperative Development Corporation (NCDC) provide refinance assistance to the State Governments, State Co-operative Banks and Commercial Banks for assisting various fisheries activities by the individuals, cooperative societies, etc.

National Cooperative Development Corporation (NCDC)

One of the main objectives of the NCDC is to finance the fisheries sector through the fishery cooperative. The main focus of NCDC in fisheries activities is to augment the income of active fishermen. In order to discharge these functions effectively, NCDC has formulated specific schemes and pattern of assistance for enabling the fisheries co-operative to take-up activities related to production, processing, storage, marketing, etc. Such assistance is provided to fishermen cooperative on liberal terms treating the activity as a weaker sanction's programme. NCDC has been providing financial assistance to fishery cooperative for the following purposes.

i) Purchase of operational inputs such as fishing boats, nets and engines

ii) Creation of infrastructure facilities, for marketing (transport vehicles, go downs, retail outlets etc.

iii) Establishment of processing units including ice plants, cold storage, etc.

iv) Development of Inland fisheries, seed farms, hatcheries, etc,

v) Preparation of experts under Technical and Promotional Cell Scheme.

vi) Appointment of experts under Technical and Promotional Cell Scheme.

NCDC plans to provide over Rs.150 crores for fisheries programmes during the Eighth Plan period (1992-97).

Fish marketing

The scheme of Strengthening of Infrastructure for Fish Marketing aims at establishing cold storage's, ice plants, fish handling sheds, retail marketing outlets etc., besides providing insulated vans for transportation of fish and bicycles with insulated boxes for facilitating retail trade. The Government of India is providing 100% assistance to State Governments for strengthening infrastructural facilities of fishery cooperatives, fishery corporations, and

fishery marketing organisations for undertaking fish marketing. A number of fishery cooperatives have been selected by the State Government for implementation of the marketing scheme in the respective states. The fishery cooperatives are expected to avail this facility through the State Governments.

There has been a major increase in the Central outlay in the ongoing Ninth Five Year Plan (1997-2002). From a mere Rs.5.013 crores allocation in the Five Year Plan (1951-56), the Eighth Plan allocation is Rs.1200 crores. Thus, the Indian Fisheries Sector has come to acquire the status of a promising industry. The State Governments, the individuals, the progressive groups, companies, corporations and cooperative are coming forward to take up small and big fishery projects, with greater and faster sophistication and modernization in capture as well as culture fisheries. The cost of investment is going beyond the reach of the poor fishermen. Thus, a deliberate thrust may have to be given to the cooperative organizations of fishermen with moderate means to admit them as partners' in progress.

How to help fisher folk farmers ?

There is need and also justification providing management services to for their development. Future model for small farmers development in India through Co-operatives by providing management services, as strategy should be adopted.

- Many times it is taken for granted that the small farmers are not able to absorb the high technology. But if assistance is provided small farmers also would adopt all recommended high technology projects. So small farmers to see demonstration plot provide technical information through village meetings training programme distribution of literature etc. Further, they should be helped to know the technology at various stages of the project at farm or at village level by technical personnel and exposing farmers to the economics of the practices.

- Co-operatives should help small farmers in finding out the requirements of inputs like seed, chemical fertilizer and organic farming inputs. Also help of to obtain these inputs at local level sale point, if not available arrange to get from the nearest sale point.

- Small farmers go for distress selling because of financial problems. Hence, Co-operative need to provide marketing assistance needed for small farmers indifferent aspects like transport to market. harvest and post-harvest technology, grading, process. Storing price information etc. to avoid distress selling and middlemen in marketing.

- Fishermen may not be able to adopt the recommended aqua technologies because of financial constraints. If timely finance is provided small farmers will adopt the recommended technology and increase their aquacultural production. Co-operatives should help small farmers in finding out the requirements of credit and in getting

loan application, filling processing and sanction without any difficulty.

- It is difficult to carry out operations due to lack of implements and equipments and farmers carry out in their own way with the available implement or equipment. So Co-operatives need to help small fishermen in getting specialized services needed to like getting seeds, implements, machinery and equipment for the use of small farmers at local level.

- Small farmers need live stock insurance for aquacultural development to escape from risk. The Co-operatives should assist small farmers in getting crop/live stock insurance cover for the crop grown and also animals maintained by small farmers. There is no need to cover all types of crops and animals under the crop insurance programme for small farmers agricultural development.

- Co-operatives need to assist small farmers in getting subsidy provided to different aquacultural programmes like construction of bunds construction of farm ponds, purchase of improved implements equipment and machinery. They need help in finding out the suitable schemes. Further, help in obtaining application, filling, processing and sanction without any difficulty.

Effective communication

All the above seven components should be integrated in one Co-operative until along with effective communication. Good communication does not consist of giving orders but of creating understanding. It does not consist merely of imparting of knowledge but to help people to gain a clear view of the meaning of knowledge.

Many misunderstanding are due to faulty communication. What are needed are more people saying right things, at the right time, in the right ways to the right people. Farmer's confidence can be achieved by careful and gradual introduction of fully approved technologies. Co-ordination with the Research is essential for current updating of the Co-operative extension worker's knowledge on the one hand and for the conveyance of the real problems from the field to Research on the other. Contacts with the relevant Researches should be very intensive. Most of them are eager to contribute to Applied Research as well as to implement their ideas in the field. There is need to establish Joint Professional teams consisting of Researches and Extension Workers to discuss ideas and problems encountered to co-ordinate experimental work and formulate recommendations to farmers.

Strategy

The dynamic strategy should be such that integrated modern techniques need to be provided by the co-operative to cater the needs of different categories of farmers particularly to small farmers along with management services for the seven essential operational activities. The whole country needs to be mapped out for immediate growth

potential areas and future growth potential areas. Governmental change agent system needs to be reoriented to co-operative package with governmental, non-governmental, industrial and business sectors as joint partners. Adoption leadership needs to be created in the country, but they must be educated. Co-operative development be an integrated inter agency responsibility rather than responsibility by only few departments. Individual small farmer need to be educated to use the available resources in a planned way with modern techniques for maximization of profit. The approach should be per day production per until area in terms of cost benefit ratio. A continuous and fruitful research on modern techniques, supported by a strong co-operative extension service with a facility to provide management services to seven essential operational activities along with effective communication, programme planning and execution. A bold policy by the Government can metamorphose the rural farmers towards modern development to become self sufficient in a short period. This calls for a strong and bold policy decisions at the highest level.

We are in to the 21st Century, we must have our "perspective plan" for the next quarter to the (upto 2020) and take appropriate steps to strengthen co-operatives as well as re orient our efforts to meet future challenges, which would be more demand driven and would require matrix mode approach. A definite change is needed at this juncture for sustainable aquaculture, environmental protection, and globalization of agriculture would also require necessary co-operative adjustments and planning.

The fishery Co-operative movement in India began in 1913 when the first fishermen's society was organized under the name of Karla Machhimar (Fishermen) Co-operative Society in Maharashtra. The State of west Bengal was the next to organize Co-operative Societies in the fishery sector in 1918. In the same year, Tamilnadu also organized one Co-operative Society. The structure continued to grew over years into multi-functional units at the primary level, federations of district/regional, state and national levels. Today there are

National Level Federation	-	1
State Level Federation	-	17
Central Level Federation (District/Regional)	-	108
Primary Societies	-	12,427

The membership at the primary level is 2.438 million

Source: No.5, November 2003, The Co-operator.

National Federation of Fishermen's Co-Operatives:

National Federation of Fishermen's Co-operatives Ltd., (FISHCOPFED) began functioning in 1982. Its goal is to facilitate the functioning of fishing industry in India through Co-operatives. Within a short period of its active functioning, FISHCOFED entered

a number of activities, both business and promotional, including organizing conferences, supporting training initiatives, facilitating exchanges, demonstrating new technologies, introducing marketing techniques, liaisoning with member organizations and providing health care and insurance to fisher community.

Under the most acclaimed centrally sponsored Group Accident Insurance Scheme for active fishermen an insurance cover of Rs.35, 000 in case of accidental death or total permanent disability are paid to the beneficiary against a premium of Rs.12 per fishermen. So far around 4889 claims have been settled and a payment of around Rs.10.07 million have made to the distressed families.

Federal Co-Operative Structure:

Co-operative and Fisheries both are state subjects and as such the federal structure vary from state to state. Depending on the needs of the states, growth parameters and other conditions, there is 2-tiers, 3-tiers or 5-tiers structure in the states. Such tiers include state federations, regional federations district federations and primary federations.

Marine Sector:

In Marine Sector three tiers structure operates in different states with the exception of Andhra Pradesh with four tier and Maharashtra with five tier structures in operation.

Inland Sector:

Similarly in Inland Sector, there is three-tier structure operating in most of the states the activities are largely controlled by the Department of Fisheries. In some of the states the fishery co-operative in the inland sector are continuing with the Registrars of Co-operative societies.

Organisational Structure of Co-Operative Societies:

In the co-operative fisheries sector existing today with the primary fishery co-operative at the base having individual fisherman as members followed by federation of primary fishery societies at the district or regional level and the state federation of the latter at the apex level.

Administration of Co-operative Society:

(Ex.Bassein Fishermen Co-operative Society, Pune)

The general meeting of members is hold once in a year and deals with such items of business as:

1. Election of the board of directors.
2. Appointment of internal auditors.
3. Approving the proceeding year's Statement of accounts and balance – sheet.

4. Allocation of profits.
5. Fixing the limit of borrowing by the society.
6. Fixing the maximum credit limit of each member of the fishing team.
7. Framing rules for collection.
8. Storage and auctioning of fish
9. Consider the audit memo and other correspondence received from the Co-operative department.

Administration mainly through Directors Board in this totally 13 members in which one is from Co-operative Financing Agency and another one is Director of Fisheries. For the purpose of running the administration of the society, the board can constitute on Executive Committee consisting of 4 persons viz.,

1. Chairman
2. Two members of board
3. Managing Directors

Agencies for Supervision:

The Board of Directors supervises the working of the Society. External agencies, which supervise the working of the Society, are:

(a) Officials of the Department of fisheries for technical guidance and ensuring proper utilization of funds provided by the department.

(b) Officials of the Department of Co-operation for ensuring compliance with the Act, the rules and the bye – laws.

(c) Officials of the District Federation of Fishermen co-operatives – for promoting better marketing of fish and other developmental activities.

The Society has maintained good relations with all the agencies referred to above.

Organisation And Administration Of The Co-Operative:

South Kanara District Fisherman Co-operative Society:

There are totally seventeen members on the board of directors for management.

a. 9 – Directors are from Primary Fishermen's Co-operative Societies.
b. 5 – are from individual members.
c. Government members

(They assist in **Technical & Administrative aspects)**

They are

1. From the Co-operative Department.
2. From Fisheries Department.
3. From Revenue Department.

Except the government nominees, all the directors are from fishermen community. Five directors are from individual members who are not active fishermen. These directors do not have any specialized training in managing the Co-operative but they are closely associated with the local conditions of fishermen and their difficulties. The nine members of the board are elected from the representatives sent by all existing primary fishermen's Co-operatives.

The board elects from among themselves on executive committee of seven members, of which three should necessarily be chosen from the representatives of affiliated societies and among the other four members the President and the Vice-president have to be included. The main functions of the committee are to grant loans, make investment, and raise funds and to admit new members.

A secretary who is not a member of the Co-operative is looking after the administration of the organisation. In addition, these is also a General Manager who is deputed from the state Co-operative Department far looking after the interests of the Government and its investment.

Fund source:

1. **Share Capital**

- By Members
- Contributed by Government

2. **Loan**

- From State Government
- From the Dist. Central Co-operative Bank

3. **Miscellaneous**

- Deposits from member and non members

Main differences between marine and inland fisherman co-operatives:

1. The Marine Society conducts its fishing operations in the sea. Open sea and unfavorable seasons are the limiting factors of a marine society while an inland society conducts its operations in inland waters like lakes, reservoirs, tanks, ponds, rivers and irrigation systems and its area of operation is restricted to a specified number of villages around the headquarters.

2. The marine society has to locate fishing grounds in the sea and resort to capture fisheries while the Inland society has to obtain stock of fish seed, rear them and exploit the fishery thus it has to resort to culture fisheries.

3. While the marine society does not need an investment on fish culture, it has to invest heavily on the fishing aids like craft and gear. The overall investment of an Inland fishery Co-operative is in significant compared to the investment of a marine society and generally it is more than 20 times that of an Inland Co-operative.

4. The landings of a marine society depend on many external factors on which fishermen have no control and it is a hazardous occupation while the inland fishermen are sure to get stable returns if only fish farming is taken up on modern methods.

Role and main functions of fisheries co-operatives:

The fisheries Co-operative structure is pyramidal in nature with definite responsibilities at various tier levels. There is a need to link each tier so that the network is strengthened vertically & horizontally.

Main functions of different tiers are as follows.

National Federation of Fishermen's Co-operatives:

- Arrange supply of fisheries inputs and equipments;
- Transfer technology to fishermen through Co-operating;
- Insurance cover to fishermen;
- Procure pond / lake on the lease basis for development of fish breed and sale of fish at reasonable price;
- Provide health care and family welfare services to the members of fishery Co-operatives;
- Setting up of training – cum demonstration units;
- Marketing of fish and fish seed and export promotion;
- Research and consultancy in fishery Co-operatives

- Publications; and
- Liaison with Government, NCDC, NABARD, Co-operative Institutions and other International Agencies.

State Federation of Fishermen's Co-operatives:

- Promote and develop fisheries Co-operatives in the State;
- Raise Capital through Shares, deposits and borrowings;
- Procure and distribution of required fishery inputs & equipments;
- Marketing of fish at reasonable rates;
- Undertake processing activities and export of fish products;
- Technical guidance; and
- Liaison with state Govt., NCDC, NABARD, FISHCOPFED, FFDA, Co-Operative Banks and other concerned agencies.

District / Primary Fisheries Co-operatives:

- Motivate fishermen to organize Co-operatives.
- Procure fish from members and provide complete infrastructure for sale of fish;
- Provide fish seed, net and other inputs equipments; and
- Arrange technical guidance for members.

Role of NCDC in fishery co-operatives:

NCDC has been playing a critical role in assisting fishery co-operatives. NCDC has formulated specific schemes for them and the pattern of assistance to enable than to take up activities relating to production, processing, storage and marketing, etc. This financial assistance is provided for

i. Purchase of operational inputs;

ii. Creation of infrastructural facilities for marketing in terms of transport vehicles, cold storage etc.

iii. Integrate fisheries development projects for inland, marine and brackish water fishery.

Reasons for failure of fishermen co-operative society:

1. Lack of Co-operative spirit among the fishermen and formation of Co-operatives only for the purpose of utilizing financial assistance provided by the governments.
2. Infiltration of vested interests into co-operatives and diversion of funds only to selected influential members.
3. Absence of economic and viable units.
4. Absence of link between credit and marketing.
5. Lack of timely or continuous audit.
6. Absence of Co-ordination between the various departments like fisheries, co-operation, revenue, irrigation, etc.
7. Inability to provide adequate loan to the members in times of need.
8. In adequate financial provision made by governments for organizational and developmental purpose.
9. Lack of trained managerial personnel etc.

Suggestions for the improvement of fisheries co-operatives:

1. Since middle men play a major role in fish marketing in the country only 3 to 5% of total fish catches are handled by the Co-operative society, it is suggested that at least 50% of total production should be marketed through Co-operatives.
2. The members of fisheries Co-operative Society, who have availed finance, should be made to dispose of their catch only through co-operatives by providing the working capital requirement these by avoiding the role of middlemen.
3. The Co-operatives should be given preference in leasing of water bodies, which belong to the Panchayat, Union Public (PWD) and that too for a longer period of lease.
4. To Co-operative which are not structuralism fund should be provided towards working capital requirements.
5. Credit through Co-operative should be provided based on the credit worthiness of the members.
6. Commercialized & Nationalized bank should provide loans through Co-operative with tied up arrangements for marketing of the produce.

CHAPTER XIV
RISKS AND UNCERTAINTIES IN FISHERIES

Risk

It refers to a situation in which one is not sure of the outcome, but can establish probabilities of an outcome.

Risk refers to the possibility/probability that some unfavorable event will occur. It is the probability of loss, injury, and exposure to harm. In aquaculture, risk comes from the stock losses. Anything that disrupts the rearing of fish is likely to jeopardize production and marketing of the final product. With the probability data, the fish farmer can protect his farm business, to a certain extent, through adjustments in his production schedule, insurance, hedging etc.

The levels of risk vary among species and at different stages of production. The relative lack of knowledge of fish biology in comparison to some land animals makes fish production more risky than the production of food animals. There are numerous risks involved in the breeding, hatching, and growing of aquatic organisms under intensive management systems.

Types of risks:

Risks plaguing aqua-cultural industry may be classified into two main groups:

A. Socio-economic or business risks.

B. Physical or pure risks.

A. Socio-economic or business risks:

a) Social risks:

Social aspects of socio-economic risks include changes in tastes, attitudes or social behavior towards production and consumption of a certain species. The expansion of aquaculture depends on individuals changing their attitudes towards species cultured under intensive closed systems. This may be done through government programs, advertising, and public relations. For example, changes in consumer purchases of catfish have been achieved through advertising and public relations in the US. The growing popularity of catfish may be stifled, however, if off- flavor problems continue to plague the industry.

b) Economic risks:

Economic risks such as changes in price of inputs and outputs, inflation, recession, depression and other economic conditions that affect national income are primary concerns of commercial fish producers. As demand lags behind supply, producers are concerned that prices will fall. This is presently the case in the U.S. catfish industry. Producers are warned that they should secure markets before expanding production. Also, the degree of elasticity with respect to supply and demand at both the farm and processor level is a clue to the level of economic risks associated with fish production. Processors facing a more inelastic demand than producers will tend to be less concerned about demand lags. This is one reason that producers are beginning to favor more producer associations or cooperative type of marketing organizations.

c) Marketing risks:

Risks may also result from uncertainty in demand, supply, and prices. When to move the product to market is the age-old nemesis of farmers. Fish farmers are no different. Significant seasonal price level differences exist in many aquaculture product markets. Today, more farmers in colder climates are overwintering fish to try to market them when there is less supply available to consumers. Additionally, new technologies and product forms are being evaluated in an attempt to avoid some of the marketing risks. Smoked fish, as well as dried, frozen, or canned fish are forms used in various markets to reduce the risks associated with marketing time.

Assume that forecasters are overly optimistic in their estimates of prices and consumer demand. This optimism is likely to encourage farmers to intensify production (higher stocking rates) in the short-run and expand production (more ponds) in the long run. Intensification increases the potential for diseases, problems such as off-flavor, and other environmental concerns. The fish arrive at the market only to remain unsold because of weak consumer demand resulting from a dislike for the quality of the fish on the shelf, or insufficient income to purchase fish and other market foods.

d) Production risks:

Many of the marketing risks are also related to production problems. Marketing problems may be logistical in nature that may impede production schedules. The

timely supply of fingerlings may affect the quantity of foodfish produced at a given time. This may result in grave financial problems for producers. Production risks may also be due to lack of trained manpower to manage the operation. This results in serious constraint or even failure in any aquacultural enterprises.

e) Other risks:

Other socio-economic risks encountered are financial and political. Financial risks relate to changes in supply of funds for production and marketing. Credit restriction and availability often affect the aquacultural industry. Lack of education and understanding of aquacultural production processes among lenders is common in areas where the industry is developing.

Political risks affect not only an enterprise, but also the whole sector. Changes in government and governmental policies have been known to cause changes in supply and demand of inputs and fish. Governmental regulations may affect all stages and aspects of the industry. Regulations on feed, import of inputs, the introduction of species, and changes in labour laws may greatly influence the industry.

B. Physical or Pure risks:

Physical risks result from conditions of nature, such as rain, windstorms, clouds, flooding and drought. Other types of pure risks are plant breakdowns, and failure of safety and other devices. These risks associated with physical or pure risks can be managed to minimize their effects on producers.

Uncertainty:

It is a situation in which the probability of an outcome is not known. Insurance cannot provide any cover against uncertainty. Uncertainty is a state of being doubtful about future events, which cannot be foreseen exactly.

Types of Uncertainty:

a) **Price uncertainty:** It is associated with the price of products and input factors, such as price of fish in a market.

b) **Yield uncertainty:** The fluctuations in yield are associated with weather conditions and incidence of diseases and pests and the impact of new practices.

c) **Technological uncertainty:** Technological changes influence production function and create conditions of variability, which, in turn, lead to uncertainty.

d) **Institutional uncertainty:** Conditions of tenure, functioning of credit agencies, action and outlook of farmers are examples of institutional uncertainty.

Steps against risk and uncertainty:

Risk is so important in aquaculture that risk management programs should be in place if the industry is to advance. Secretan (1988) defines risk management as the identification, measurement and economic control of risks that threaten the assets and income of the business venture. Over the years, several strategies have evolved which may be used to reduce risk. Among these are product diversification, alternative marketing periods, insurance, contracting, government programs, and third party equity capital and safety devices.

(a) Diversification:

A farmer follows diversified farming as a precaution against risk and uncertainty. Product diversification in which more than one ' cash crop ' is produced provides for alternative income streams in the event when one fish or species harvest fails. It is one of the oldest methods of risk management. Farmers are known to produce several products in order to spread their risks among many enterprises. For example, fish farmers can invest in the feed and processing industry. Integrated aquaculture i.e., fish with any other livestock such as fish-cum-poultry, fish-cum-pig, fish-cum-duck etc.; fish-cum-paddy are practiced in some places. Polyculture/multispecies production is also pervasive in developing economies and it is effective in reducing variability of farm production.

A note should be made that diversification does not always reduce risks. The heightened demands placed on management through diversification may actually induce greater risks because of management stress. However, diversification more often reduces production and physical risk problems.

(b) Crop insurance:

Crop insurance against risk involves the substitution of a small known cost for the possibility of a large but uncertain loss. Insurance from either private or governmental sources may help in the event of catastrophic losses, such as fish kills due to weather changes, low dissolved oxygen, disease etc.

Fluctuations in farm incomes resulting from variation in crop yield are one of the most significant features in agriculture. Diversified farming, by itself, is inadequate in view of weather and monsoon conditions. Crop insurance is an important technique by which the farmer can protect his income and investment from the disastrous effects of crop losses due to natural hazards.

In purchasing insurance, the farmer incurs cost and in fact, he pays some one else to assume the risks of loss from the production of a particular commodity on his farm. The insurance companies are able to accept the risks of loss from natural hazards on individual farms, because they are able to spread this risk over a large number of farms.

Crop insurance provides the following benefits to farmers:

- It offers protection to farmers against the failure of crops and thereby stabilizes their farm incomes.
- It improves their creditworthiness in securing loans from a credit agency.
- It gives greater confidence to farmers to venture upon the adoption of modern technology involving larger expenditure on modern inputs and greater risk due to weather condition and attack of insect, pests and diseases.
- It reduces the government obligation to provide relief in case of crop disaster to the extent farmers themselves pay premium.
- Rural communities and trade centers improve their income stability as a result of the stabilization of the farmer's income on which they depend.

(c) Continuous or Sequential Marketing:

Variability in marketing time may occur when the crop is released to the market in a more or less continual stream, or periodically as the market may dictate. Sequential marketing involves the sale of the product at different periods.

(d) Future Market or Production Contracts:

Contracts provide producers with specific prices and quantities at the end of a specific period. Forward contracting allows a fish farmer to contract with a processor to supply current growing fish stocks or even unstocked fish on some future date at a particular price. This strategy of contracting future supplies is undertaken to reduce the

risks associated with market price changes.

The forward contract also may be restrictive on farmer incomes. If market prices exceed contract levels on the due date, the contractor (buyer) gets added benefits.

The production agreement is similar to the forward contract. Such agreement is especially popular for highly perishable products such as truck crops, eggs, and fruits. Under this arrangement, producers typically supply the land (ponds) and basic resources (labor and water) to produce the crop. The processor/buyer provides the fish stocks, feed, chemicals and other inputs to the producer, and then harvests the stocks when they are ready for market. The producer essentially becomes a laborer for the buyer. All risks for production except failure to perform agreed tasks fall on the contracting buyer.

(e) Government Programs:

In developing countries like ours, there are few direct government programs for aquacultural production.

Participation in government programs may be used to finance the operation during difficult times or to purchase needed items to increase production and efficiency in production. Government benefits such as favorable credit terms, low interest rates on pond construction or capital purchases, or even price subsidies are available in some countries. As environmental concerns regarding the quality of aquacultural pond effluent water increases, the likelihood for government programs to assist farmers in reducing risks associated with possible pollution will increase. No matter what the reason given for providing special programs, the reduction in risks is the reason sought.

(f) Third-Party Equity Capital:

The use of outside equity capital allows the fish farmer to transfer some risks to others. The primary incentive for using outside capital is the high initial cost for a producer. Acquiring the necessary land area, building ponds, and securing an adequate water supply near reliable market outlets may be both difficult and expensive. Additionally, the learning curve for a new producer may be too long for one individual to afford. An added incentive is that having additional capital may mean opportunities for more intensive fish stocking levels, which in turn lead to greater potential profits. Thus, there are circumstances when outside capital is quite beneficial.

(g) Use of Safety Devices:

Many automated systems involving radio-signals, computer warnings and automatic

telephone dial-out are presently employed in aquaculture. These systems are complex and may result in losses if they malfunction.

Aquaculture authority bill (1997)

Aquaculture authority bill is a bill to provide for the establishment of an Aquaculture Authority for regulating the activities connected with aquaculture in the coastal area and for matter connected there with or incidental there to.

The Authority shall exercise the following powers and perform the function, they are:

1. To prescribe regulation for the construction of aquaculture farm within the coastal area.
2. To inspect aquaculture farm with a view to ascertaining their environmental impact caused by aquaculture.
3. To grant licenses to aquaculture farm.
4. To order removal or demolition of any aquaculture farm, which is causing pollution after hearing the occupier of the farm.
5. No license to be granted for aquaculture farming proposed to be carried out within 200 meter from high tide line (HTL). HTL means the line on the land up to which highest water line reaches during spring tide.

Conclusion:

By the introduction of Aquaculture Authority Bill the aquaculture sector development with environmental protection can be achieved. So it will be beneficial to the people also to the protection of environment and problems created by the haphazard farming will be controlled. It will be a great step for fishery sector in India.

National legislations:

Territorial Waters, Continental Shelf, Exclusive Economic Zone (EEZ), and other Maritime Zones Acts, 1976:

This Act delineates the limits of each zone in the Indian waters, in consonance with the respective provisions of the Law of the Sea Convention. The definitions for each zone and regulations prescribed under the act are as follows:

Territorial Waters:

It extends from the baseline upto 12 nautical miles in the sea. A few important regulations prescribed under the Act are:

a) Without prejudice to the provisions of any other law for the time being in force, all foreign ships (other than warships including submarines and other underwater vehicles) shall enjoy the right of innocent passage through the territorial waters.

b) Foreign warships including submarines and other underwater vehicles may enter or pass through the territorial waters after giving prior notice to the Central Govt. provided that submarines and other underwater vehicles shall navigate on the surface and show their flag while passing through such waters.

Contiguous Zone:

The contiguous zone is an area beyond and adjacent to the Territorial waters and the limit of the contiguous zone is the line, every point of which is at a distance of 24 nautical miles from the nearest point of the baseline. The regulations applicable to territorial waters are applicable to contiguous zone also.

Exclusive Economic Zone (EEZ):

The EEZ is defined as a sea area upto a distance of 200 nautical miles from the baseline.

Continental Shelf:

The continental shelf comprises the seabed and subsoil of the submarine areas that extend beyond the limit of its territorial waters throughout the natural prolongation of its land territory to the outer edge of the continental margin or to a distance of 200 nautical miles from the baseline.

Both in the EEZ and continental shelf, India has and always had, full and exclusive sovereign rights

a) For the purpose of exploration, exploitation, conservation and management of all resources

c) Exclusive rights and jurisdiction for the construction, maintenance and operation of artificial islands, offshore terminals, installations and other structures and devices necessary for the exploration and exploitation of the resources of the continental

shelf or for the convenience of shipping or for any other purpose.

d) Exclusive jurisdiction to authorize, regulate and control scientific research, and

e) Exclusive jurisdiction to preserve and protect the marine environment and to prevent and control marine pollution.

Coastal regulation zone (CRZ):

The entire coastal stretch has been divided into zones from lowest low tide to highest high tide line that is a no development zone for all purposes and the coastal stretches within 500 m from the high tide line on the landward side. CRZ is classified into four categories, namely:

Category I (CRZ-I):

Areas that are ecologically sensitive and important, such as national parks or marine parks, sanctuaries, reserve forests, wild life habitats, mangroves, corals or coral reefs, areas close to breeding and spawning grounds of fish and other marine life, areas of outstanding natural beauty or historically famous or heritage areas, or rich in genetic diversity.

Category II (CRZ-II):

The areas that have already been developed upto or close to the shoreline. For this purpose, ' developed area ' area is referred to as that area within the municipal limits or in other legally designated urban areas which are already substantially built up and which have been provided with drainage and approach roads and other infrastructural facilities, such as water supply and sewage mains.

Category III (CRZ-III):

Areas that are relatively undisturbed and those, which do not belong to either category-Ð or ÐÐ. These will include coastal zone in the rural areas (developed and undeveloped) and also areas within municipal limits or in other legally designated urban areas, which are not substantially built up.

Category-IV (CRZ-IV):

Coastal stretches in the Andaman and Nicobar, Lakshadweep, and small islands, except those designated as CRZ-I, II or III.

Norms for Regulation of Activities in coastal areas:

No new construction shall be permitted within 500 m of the HTL (CRZ-I). Buildings shall be permitted neither on the seaward side of the existing road nor on seaward side of the existing authorized structures (CRZ-II).

The area upto 200 m from the HTL is to be earmarked as ' No Development Zone'. No construction shall be permitted within this zone except for repairs of existing authorized structures not exceeding FSI, existing plinth area and existing density

(CRZ-III).

No new construction of building, dredging, sand mining, underwater blasting in and around coastal formations shall be permitted (CRZ-IV).

CHAPTER XV
PRICE ANALYSIS

Introduction

Price analysis is the study of past price movements and the supply and demand factors associated with them. According to Tomek and Robinson, price analysis refers to the quantitative study of demand and supply relationships. Price analysis, thus, explains how and why prices have behaved in a particular manner. It also explains whether there is consistency in the behaviour of commodities over time and space.

Need for price analysis

Price analysis is necessary for the following purposes.

(i) Explanation of behaviour of current prices and related variables.
(ii) Analysis of the effects of alternative policy proposals.
(iii) Forecasting of price and other variables.
(iv) Decisions on merchandising and advertising policies.
(v) Execution of price policy decisions.
(vi) Testing of old and establishing new principles of value and price.

What is price?

The price of a commodity is its value expressed in terms of a standard monetary unit. The value of any good is its power to command other goods in peaceful voluntary exchange. Exchange is carried on through money, which is the medium of exchange. Thus, the price of a commodity is an exchange value in terms of money. Price can also be said to be a ratio of exchange between a quantity of money and a quantity of something else.

Role and functions of prices

Prices have several functions in an economic system. Some of these are given below:

(i) They serve to strike a balance between demand and supply.
(ii) They serve as allocators of resources in the production system.
(iii) They serve as allocators of consumers' income.
(iv) They serve as distributors of income among different sections of the society.
(v) They regulate movement of commodities over time and space.
(vi) They affect the rate of capital formation in different sectors including fisheries.
(vii) They help to monitor and forecast economic conditions and
(viii) They help to gauge the impact of monetary and fiscal policies.

Price analysis requires knowledge of the following aspects:

(i) Special characteristics of prices in fisheries as against prices of manufactured goods.

(ii) The meaning, concepts and implications of prices at different stages of marketing (e.g. wholesale and retail prices) and terms used in describing various administered prices (like minimum support price, procurement and issue prices)

(iii) Price statistics (their nature, methodology and form of availability) and price index numbers.

(iv) General price level and inflation.

(v) Inter-temporal analysis of price behaviour.

(vi) Spatial price movements and market integration.

(vii) Analysis and causes of fluctuation in prices and measures to stabilize prices.

(viii) Price forecasting.

(ix) Demand-price and supply-price relationships.

(x) Pricing of fisheries commodities.

(xi) Government intervention in pricing of commodities and price policy instruments.

(xii) Pricing efficiency of markets

(xiii) Price analysis also requires a sound knowledge of economic theory, characteristics of the fisheries sector, as well as a sound knowledge of quantitative tools as the analyst has to draw heavily on applied econometrics and statistics.

Special characteristics of fisheries distinguishing it from other natural resource industries

As already mentioned, awareness about the uniqueness of the fisheries sector is essential for fish price analysis. Some of the important aspects in this regard are:

1) Common property nature of fisheries
   The implication of this fact is that management responsibilities reside with an institution rather than with individual owners, as is the most frequent case in agriculture.
2) There is always uncertainty associated with the output of fishing operations.
3) The yield from the resources is limited as in the case of marine capture fisheries.
4) Multiplicity and high perishability of fisheries products.
5) The scattered nature and isolation and remoteness of small-scale fishing communities pose a problem during data acquisition.
6) High seasonality of fishing operations and seasonal migrations of the fishermen following that of the resources.

Determinants of fish prices

1) The methods by which fish are caught often determine prices. For e.g. line caught tuna may be more valuable in the market place than tuna caught in a purse seine.

2) Time between capture and use.
3) The way fish is processed and held on board influences the final price; cleaning, gutting, icing, the use of containers, storage temperatures, etc. may all have effect on the value of the fish.
4) The way in which fish is handled; e.g. fish damaged by hooks may attract a lower price than fish boxed at sea.
5) The physical characteristics of wholesale and retail markets such as air conditioning and cleanliness may influence prices.
6) The grading procedures and the sales procedure itself i.e. price descending or price ascending auctions or contracts may be significant.
7) The distribution system for fish - many issues such as processing, distribution systems, packaging, sales procedures and payment methods are important.
8) Consumer attitudes, income and cross elasticities of demand are influential and variable between countries and social groups within countries.
9) The prices of substitutes, such as other animal protein foods are important in price determination.

Difficulties in acquisition of economic data regarding fish prices

Mr. David Insull [FAO consultant], reports that there is evidence in several countries that fish prices have been rising more rapidly than prices of other food products and, perhaps, than inputs into fisheries industries. If prices are rising rapidly, then there are important implications for the management of fisheries and for consumption by low-income consumers.

The information necessary for constructing output weighted price indices[price index numbers will be discussed later] is, however, very difficult to obtain. Only a few countries collect wholesale prices. The definition of wholesale prices is not always clear and quantity* weights are not generally available. In some countries data are collected but not reported.

There are difficulties in acquiring information on ex-vessel prices. One is the strong fluctuation in fish prices:

-By species, by season, markets, location, daily range etc.

-Between landing places and within one day at the same landing place.

Another difficulty, particularly in tropical zones, is the large number of species entering the market with the variation in prices for different sizes of the same species and for different quantities of products.

In some countries, price data are available and has been collected for several years, but has not been collected in a way that permits economic analysis for development planning management purposes. For e.g. price data cannot be related to the corresponding fish quantities and qualities transacted or the corresponding flow of the fish from the harvesting

to the processing and to the marketing sectors.

Important concepts related to prices

Prices at various stages of marketing

Farm harvest price [FHP]

The farm harvest price of a commodity is the average wholesale price at which the producer-farmer sells it to the trader on the farm or at the village site during the specified harvest period, which is six to eight weeks after the commencement of the harvest season. A closely related but different term is the harvest price or harvest season price. This is the price received by the farmer in the primary assembling market during the same period as farm harvest price.

Wholesale price

The price at which the bulk of the produce is transacted during the peak marketing period in a wholesale market is considered the wholesale price of a commodity.

Retail price

The retail price is the price at which a commodity is made available to the consumers by retailers/traders. At the retail level, the commodity is transacted between the retailer and consumers in small lots.

[The distinction between wholesale and retail prices is basically in terms of the relative size of the lot transacted. Whether a particular size of transaction is wholesale or retail varies from commodity to commodity.]

Producer's price

Producer's price is defined as the net price received by the farmer on selling his produce.

PP = FHP or WSP minus MC

Where,

PP = producer's price of a commodity
FHP = farm harvest price
WSP= wholesale price
MC =marketing cost per unit of commodity incurred by the farmer.

[Where the buyer from the farmer's premises lifts the produce, the price received by the latter is same as the producer's price because the marketing cost is zero]

Free on Rail [FOR] price

This is the price inclusive of railway freight up to the railway station nearest to the buyer's place of business. In other words, at this price, the commodity is delivered by the

seller at the railway station named by the buyer. The cost of transportation or railway freight is borne by the seller.

Border price

This term is used in cross-country trading. The price of a good at a country's border is known as the border price. In the case of export of commodities, this price is known as Free on Board [FOB] price and in the case of import of commodities, it is known as Cost, Insurance and Freight [CIF] price.

Prices according to time frame

Short-period price or Market price

It is the price at which at which a certain commodity* is transacted at a particular time and space. There are variations in the market price even during the course of the day in a market. Hence, it is also called the short-period price.

Long-period or Normal price

The concept of normal price is a theoretical one. This price is an average over a period of time, say a season, year or several years. Since the normal price is some sort of average price it does not refer to a particular time, place or quality of the commodity. In fact, market prices or short period prices fluctuate around this notional normal price.

Cash/Spot price

Cash or spot price is the price at which commodities are transacted on spot in the market or when the payment for the transacted quantity is made immediately after taking delivery. Payment does not necessarily imply that currency changes hands. It may be only book entries. The deal is finalized on the spot and delivery by the seller takes place. The markets where such prices prevail are termed spot or cash markets.

Forward price

The forward price of a commodity is the price which is settled for delivery of goods on a future date. The deal is finalized on the spot and the delivery takes place later. Forward prices exist for only those commodities which forward trading is permissible under the Forward Markets Control [Regulation] Act, 1952. The market where the forward price system legally prevails is known as the forward market. e.g. as in Scandinavian countries.

Administered Prices

The administered price of a commodity is the price fixed by the government with the objectives of protecting farmers against a decline in prices during years** of bumper production, protecting consumers from excessive price increases during lean production years and ensuring procurement for the maintenance of buffer stock or operation of the public distribution system. A brief description of the different administered prices is given

below:

Minimum or Support price

This is the price fixed by the government to protect the producer-farmer against excessive fall in prices in the event of bumper production. In case the market price of a commodity falls below the minimum price, the government will purchase the entire quantity offered by the farmers at the minimum price.

Maximum or Ceiling price

This provision prohibits a trader from charging a price higher than the maximum price. This price is fixed by the government to protect the consumers from unwarranted price increases. There is no ceiling price in agriculture or fisheries in India.

Fixed Administered price

Fixed administered price is neither the minimum nor maximum price but denotes the level at which a seller has to sell his produce. Obviously, this can exist where the seller is in an organized sector, e.g. the price of electricity, diesel for boats etc.

Procurement price

This refers to the price at which the government procures it from producers/ manufacturers to maintain a buffer stock and feed the public distribution system.

Issue price

This is the price at which the commodity is made available to consumers at fair price shops. The objective of this price is to safeguard the interest of the consumers [this is for commodities included in the public distribution system]. The issue price is always higher than the procurement price. The difference is maintained to account for the handling cost. Part of this difference is made good by allocated funds from the treasury and is termed as food subsidy.

Other terms related to price are:

Remunerative price, Fair price, Incentive price, Input price, Product price, Parity price, Prices paid by farmers, Prices received by farmers, Real prices, Shadow price, etc.

Price statistics in India

Price statistics on a time series basis is very essential for price analysis. A sound pricing policy cannot be formulated without reliable and comparable data on prices on a continuous basis. It is therefore essential to know the agencies publishing price statistics, the methodology used in collection, compilation and reporting of price statistics, the forms of price statistics, the sources of price statistics and price dissemination.

Organizations involved with collection and compilation of price statistics

Many organizations collect, compile and publish data on prices at the national and state levels in India. Reports and bulletins are brought out regularly or on an ad hoc basis. Some of these organizations are

1. Directorate of Economics and Statistics, Ministry of Agriculture, Government of India
2. Labour Bureau, Ministry of Labour, Government of India.
3. State Bank of India
4. National Sample Survey Organization [NSSO]
5. National newspapers
6. State-level Directorates of Agricultural Marketing
7. State Agricultural Marketing Boards
8. Local newspapers

Forms of price statistics

A price analyst has to rely on the series or sets of prices collected and tabulated by other agencies. The series of price data that are available with other organsations are in different forms and collected via different methodologies. Therefore while borrowing price statistics, the analyst should obtain details on the methodology used by the agency for the collection of data like markets covered, frequency of collection, marketing stage to which the prices pertain and products or fish species covered. Some forms of price statistics are discussed below.

Raw data

Price data which have not been subjected to any statistical analysis are termed as raw price data. Some important raw data are:
Daily, weekly and monthly price quotations
Lot wise price quotations etc.

Raw data can be got from primary [direct] sources or secondary [indirect] sources.

Processed data

Data which have been subjected to some processing with the help of various statistical techniques are termed as processed data. Price statistics, which are generally used by most price analysts, are generally processed. These include:

Weekly, monthly and annual wholesale price data for the markets districts and states. These are obtained by subjecting raw price data to simple and weighted averages; annual landing centre prices for capture fisheries, farm harvest and harvest season prices in case of culture for different species in various districts and states; determination of relevant price index numbers so that inter-temporal and inter-commodity comparision can be done.

Price index numbers

Apart from the index of farm harvest prices for agricultural commodities, there are four important price index numbers compiled in India at the national level. These are as follows:

- Consumer price index numbers for industrial workers [CPI-IW] compiled by the Labour Bureau at Simla. These are designed to measure the changes over a period of time in the level of retail prices of a fixed basket of commodities and services on which the industrial workers spend their income.
- Consumer Price Index Numbers for Agricultural Labourers [CPI-AL] also compiled by the Labour Bureau. They serve as one of the guiding factors for fixation and revision of minimum wages of agricultural labour under the Minimum Wages Act.
- Consumer Price Index Numbers for Urban Non-manual Employees compiled by the Central Statistical Organization. They indicate the changes in the prices of a consumption basket of the middle class in the country.
- Wholesale Price Index Numbers [WPI] compiled by the Economic Advisor, Ministry of Industry, Government of India. The current index covers 360 commodities and 1,279 price quotations.

Time-Series and Cross-Section Data

Quantitative data used in price analysis are of two types – time series and cross section. Time series data refers to a set of observations on a particular variable at different points of time, whereas cross-section data refer to a set of observations of different variables at a given point of time. Such data are termed as a cross-section of time series or a time series of cross-section.

Price dissemination

Modes of dissemination

Price statistics are of little use unless they reach the persons who need them. Various methods [personal contacts, posts and telegraph. newspapers, price bulletins] are used in the dissemination of price statistics. The All India Radio is also involved in this. Such statistics help farmers take decisions regarding when, where and in what form to sell. Similarly, traders and bulk consumers also need such information.

Interpretation of price information

The utility of price information varies according to the user. A user who is good in his interpretation of the available information, reaps the benefit from it.

Steps in the collection and compilation of price statistics

Selection of commodities

- Selection of varieties for e.g. species
- Selection of markets
- Selection of sampling method
- Supplementary information regarding markets and products like market arrivals of the produce, turnover of the produce, stocks held by processors and demand from other markets.
- Compilation
- Presentation and analysis

Time Series in prices

Price movements are associated with the conditions that have a relation to time. Changes in the factors affecting the demand and supply of various commodities occur continuously but their effect on demand and supply and the resultant effect on prices require various lengths of time. Therefore, price movements are usually classified according to time.

A time-series of prices is a set of observations taken at specified times, usually at equal intervals. The intervening period or the intervals may be an hour, day, week, month, season or year. Mathematically, a time-series can be expressed as follows:

$$Pt = f(t)$$

Where, Pt is the price of a commodity in time t and t is time variable.

Based on the duration of the time period involved, the following six major time elements in prices have been identified. These are often called components of a time-series.

Based on the duration of the time period involved, the following time elements in prices have been identified. These are often called components of a time-series.

- Secular or long-term price movements
- Cyclical price movements
- Year-to-year price movements
- Seasonal price movements
- Short-period price movements
- Irregular or episodic price movements

Trend or Secular price movements

The tendency of prices to move up or down over a longer period of time is termed as trend or secular price movement. A trend in prices is usually established on the basis of at least 10-15 years' data. For e.g. globalisation of the economy as a whole has accelerated remarkably in recent decades, forcing substantial dynamic change in many

fisheries. This structural change, together with trade liberlisation in the global economy, has had major impacts at various levels. First, globalisation is affecting fish price levels and competition between seafood and other categories. Second, globalisation affects the nature of seafood markets. For e.g. Processing companies which used to rely on local or national catches, can now process fish bought to their plants from any where in the world. This shields these plants from local variability in stock sizes, and fluctuation in local landings.

Cyclical price movements

A cycle is defined as a regularly occurring phenomenon. When this phenomenon occurs in movement of prices, it is termed as a price cycle. Cyclical fluctuations refer to swings around a trend line. Regularly occurring upswings and downswings or oscillations in prices are termed as cyclical fluctuations in prices. It is well known that the price of fishes vary according to season, reaching lowest levels during periods of bulk landings and rising when the landings are less. Conventionally, periodic movements in prices occurring regularly within a year or intra-year are termed seasonal movements. Oscillations involving more than one year are termed as cyclical fluctuations. To characterise the price movements of a commodity as cyclic, the prices prevailing over a fairly large numbers of years have to be observed. The important characteristics of a cycle in price movements are its length and extent of upswings and downswings [amplitude].

Year-to-year fluctuations

Changes in prices from one year to another are known as year-to-year price fluctuations. Demand plays a relatively smaller role in year-to-year price fluctuations. Production or supply plays the main role within this time frame.

On longer time scales, the consumer attitudes change. The demand schedule may change over time, on a time scale longer than that of simple fluctuations, in response to changing consumer preferences or changing income levels. Demand may also undergo rapid regime shifts. For e.g. in recent decades, shifts over a short period of time have resulted from publicity about health issues. An awareness of the relative healthiness of fish [compared with red meat] led to a substantial 'outward shift' in the demand curve, while a shift inward followed publicity over ocean pollution and possible contamination of fish in the sea.

Seasonal price movements

Seasonal or intra-year price variations are regularly occurring upswings and downswings in prices that occur with some regularity during the year. Seasonal price variations resemble a cycle covering a period of 12 months or less.

Short-period price movements

Short-period price movements cover a short period i.e. within a season. It may be an interval of hours, days, weeks, fortnight or month. Prices for fish can vary widely over

short time frames, due to variations in the availability of the fish itself [e.g. whether stocks are abundant are not, whether the fishing is open or closed in the relevant area] and the availability of substitutes [including other species of fish, and other protein alternatives such as meats]. In general, here price fluctuations are reversible and simple to detect. It should be noted that in certain cases, such as local fishery supplying a specific local market, price fluctuations are integral to the fishery system, rather than representing a fundamental externally driven change.

Irregular or episodic price movements

Irregular or episodic price movements represent that part of the behaviour of prices which is not systematic i.e. a particular price movement may not recur in the future. No generalisations can be made about such price fluctuations because of the diversity in their nature and irregularity of the cause and effect relationship in their occurrence. They may be of short or longer duration. The important factors responsible for such price movements are wars, droughts, floods, earthquakes, strikes, elections, early or late arrival of the monsoon, fear of tax rise, especially at the time of the presentation of the budget by the Government and so on.

Analysis of time series

To understand and analyse the nature of inter-temporal behaviour in prices, time series data on prices (for a commodity and specific markets/region) are necessary. The data may be weekly, monthly or yearly. A weekly or monthly observation on price has four components:

- Trend (T)
- Cyclical (C)
- Seasonal (S) and
- Irregular (I)

In case of annual or yearly price observation, the seasonal component is not present.

The analysis of time series consists of separating and studying the nature and behaviour of its various components. There are two hypotheses as to the association of these components. One is multiplicative and the other, additive.

Multiplicative hypothesis

Here, it is assumed that the components are joined together in a multiplicative fashion. In this model,

Monthly data $P_t = T \times C \times S \times I$

Yearly data $P_t = T \times C \times I$

Additive hypothesis

Here, it is assumed that the components are joined together in additive fashion. In

this model,

Monthly data	Pt=T+C+S+I
Yearly data	Pt=T+C+I

Where Pt is an observation on price for period t.

The method of separating the nature and behaviour of each component is also termed decomposition of time series.

Fluctuation and instability in prices

Fluctuations in prices can be defined as upward and downward movements which are irregular. The term fluctuation refers to the movement or changes in prices of a commodity or group of commodities at a given market place or area over time.

Instability means lack of stability. Thus, instability in prices can be defined as the state in which prices continue to change with the passage of time at a given space. The extent of instability has to be examined in relation to time. Mostly, price changes are not known in advance with certainty. Since prices enter directly in the decision-frame of farmers, both in production and marketing decisions, fluctuation or instability in prices is a cause for great worry for fish farmers as well as fishermen.

In general instability can be classified into four types:

- Short-term instability
- Intra-year instability
- Inter-year instability
- Long-term instability

The nature and causes of price movements involving these varying lengths of time have been discussed earlier.

Extent of instability

Both graphical and quantitative methods can be used to assess the extent of instability in prices.

Graphical approach

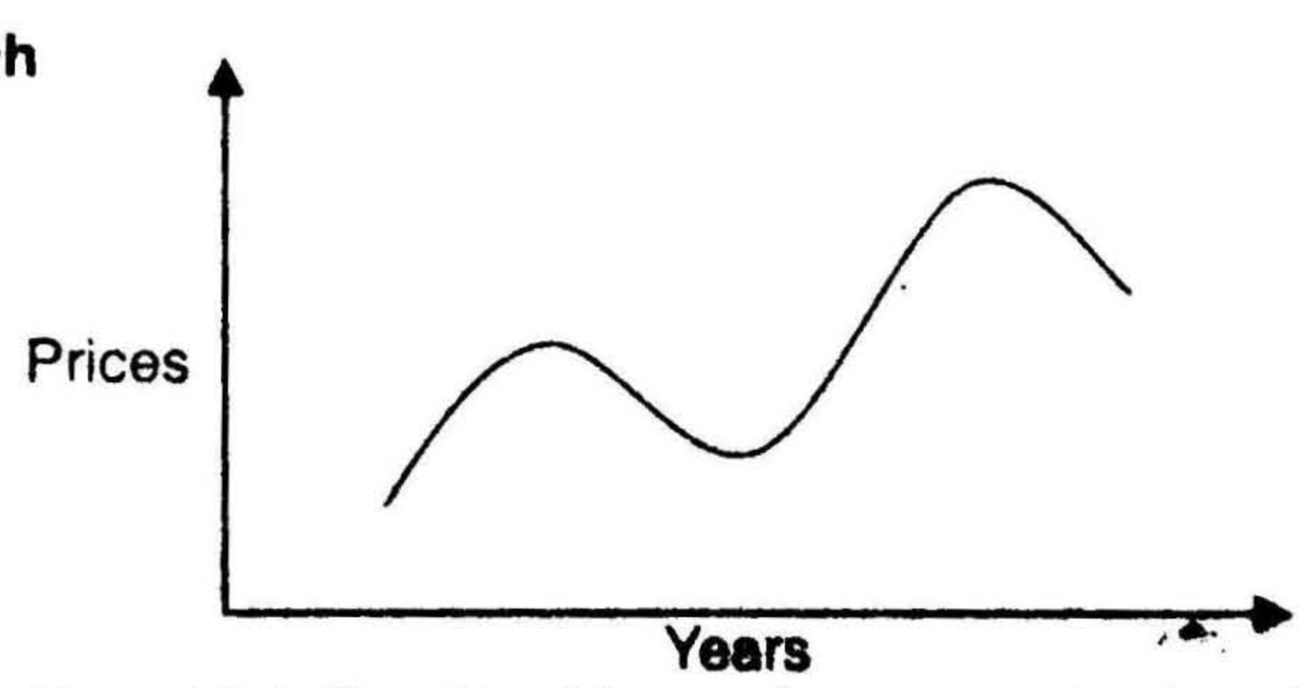


Fig : 15.1 Graphical form of representing instability

The graphical approach involves preparing scatter diagrams by taking price on the vertical axis and time on the horizontal axis. This approach can only provide a comparative view and not the precise measure of the extent of instability.

Quantitative approach

The simplest measures of instability in a price series are range, standard deviation and co-efficient of variation.

Analysis of Pricing Efficiency

Concept of Marketing Efficiency and Pricing Efficiency

Marketing system is a system, which purchases the produce from the farmer at prices that not only motivate him to continue production but also help increase production through investment in new inputs. Market structure is the organization, which performs the marketing functions and is usually described through the size of the market, concentration of market power, conditions of entry and exit of firms, degree of product differentiation, flow of market information and degree of integration among different segments of the market. These structural characteristics of the market influence the market conduct, which is the behavior of the marketing firms or of the participants in respect of pricing and practices in adjustment and adapting to the market in which they function. Both the structure and conduct of the market affect the market performance and the degree of market performance is the marketing efficiency.

The efficiency of the marketing system can be broadly classified into

a) Technical or physical efficiency
b) Pricing or allocative efficiency

Technical efficiency:

This pertains to the cost of performing a function. Efficiency is considered to have increased when cost per unit of output gets reduced and this can be brought about by reducing physical losses through a change in the technology of various marketing functions like transport, storage, handling and processing.

Pricing efficiency:

This means that the system is able to allocate farm products over time and space and in various forms in such a way that no other allocation makes the producers and consumers better off. This is achieved through pricing of the product at different stages and segments of the market. This is achieved when the following conditions hold well:

i) Price differences between spatially separated markets don't exceed transportation costs.
ii) Intra - year price rise is not more than cost of storage.
iii) Price difference between various forms of the product don't exceed processing costs.

When the functions of transportation, storage, processing and retailing are performed, certain costs are involved, utility or value is added to the product and it is priced again. The pricing efficiency of the market is concerned with the extent to which prices at subsequent stages of marketing deviate from what the cost of performing these functions warrants. Pricing efficiency of a market is also concerned with the ability of the marketing system to transfer the price signals arising in one part of the market to another, i.e, if the price in the terminal market increases, with what speed and to what extent it is transferred to the farmers. It is affected by the extent of competition in the market, dissemination of market information and the attitude of market functionaries.

Spatial pricing efficiency

Usually products that are produced in a place are transported to other areas mainly because of the reason that each region is a producer as well as a consumer of any individual product. Some regions produce only what ever they require while some others produce in surplus. That which is produced more goes to deficit areas. Prices of a product are high at consuming centres or in deficit areas and decline as one move towards the source of supply i.e. the producing area. The area over which prices are thus related may be called the market area for the product.

In a free trade and competitive regime, the produce will move from the producing area (low price area) to the consuming or deficit area (high price area) till the difference in the prices between the two areas is brought down to a level equal to the transportation cost. This will also result in a rise in the price in the producing area as the supply in such an area decreases with the movement of the commodity to the deficit area. This phenomenon also implies that a rise or fall in the price in one market leads to corresponding rise or fall in the price in another market.

Spatial price differences and transportation costs

There are five aspects, which should be carefully looked into for drawing any inference about pricing efficiency. They are,

a) Barriers
b) Selection of the commodity
c) Selection of market pairs
d) Selection of price quotations
e) Components of transportation costs

a) Barriers:

This implies that there is no physical restriction on the movement of the commodity from one market to another. In case there is a physical restriction, a comparison of price difference and transportation cost will indicate the extent of pricing inefficiency caused by physical barriers. A barrier may exist only in the case of markets located in the hilly areas or when an area remains cut off due to some natural calamities.

b) Selection of commodity:

The comparison of prices and transportation costs has to be made separately for each commodity. This is necessary to safeguard against price differences arising out of differences in grades and varieties in two markets. It is necessary to compare the prices of the same grade or variety in spatially separated markets to make sure that the observed price differences are not on account of differences in varieties or grades.

c) Selection of market pairs:

A comparison of prices can be made for markets at any stage of marketing. The two markets may be in the same stage of marketing or at different stages. Only care should be taken in working out the transportation costs

d) Selection of price quotations:

The price quotations selected for comparison should pertain to the same variety, grade, and period of time or average for the same period, level of transaction and size and type of pack

e) Transportation costs:

It includes the loading charges, cost of haulage, taxes, interest on the value of goods and expenses incurred in settling the deal for the movement of the produce etc. The price differential exceeding transportation costs simply reveals market imperfection and a low spatial pricing efficiency. The gap between the price differentials and transportation costs simply provides a measure of the level of spatial pricing efficiency.

The spatial price differentials can be worked out at two levels of the market pairs.

1) Horizontal spatial price differentials:

   These are the price differentials among the same types of markets that are spatially apart, viz, among secondary wholesale markets or among village level markets.

2) Vertical spatial price differentials:

   These are the price differentials in markets operating at different levels of the marketing hierarchy such as primary or village level markets and secondary wholesale markets.

The transportation costs of a commodity between two markets is calculated by adding labour charges for loading and unloading, truck haulage charges, petrol charges, expenses of the man accompanying the produce etc. transport costs between two regions include fixed charges (independent of the distance traveled and associated with loading and unloading) and variable costs which are related to the distance over which the commodity is moved. Transport charges including handling and loading charges are often high in the case of perishable commodities.

Price Series Correlations

A single market alone does not determine the price of a commodity. The actions of buyers and sellers in a market are always influenced by the price signals from other markets. The degree to which price formation in a market is related to the process of price formation in other markets can be shown through a zero order correlation matrix of prices in these markets. It is essential that there is no physical restriction on the movement of the commodity from one market to another and the quotations are for the same grade, period of time, level of transaction and size and type of package.

The simple correlation coefficient for the prices in each pair of selected markets can be estimated by the following formula:

$$r = \frac{S\ (p_{1i} - \bar{P}_1)\ (p_{2i} - \bar{P}_2)}{\sqrt{S\ (p_{1i} - \bar{P}_1)^2\ (p_{2i} - \bar{P}_2)^2}}$$

Where

r = simple correlation coefficient

p_{1i} = price of the commodity in first market at i^{th} point of time

p_{2i} = price of the commodity

P_1 = mean of prices in the first market

P_2 = mean of prices in second market

The correlation measure of price series need not necessarily be high even if the markets are integrated. In some situations even high correlation between the prices will not indicate the degree of market integration and perfect competition.

1. In a time of secularly rising prices due to population growth and increased effective demand, the correlation coefficient rises
2. The local markets which trade absolutely or relatively little with each other may have similar price responses to temporary synchronous local forces of supply and demand
3. The monopoly procurement of a commodity at fixed prices will yield inter market price correlations as high as 1 as the time series data for two places would be identical
4. Stable margins or stable prices as could exist in monopoly in perfect competition may also result in high correlation coefficient

These show that price series correlations have to be interpreted with these limitations in view.

Factors affecting spatial pricing efficiency

Pricing efficiency among the spatially separated markets is affected by several

factors. Some of the factors are given below

1. Distance between the markets: measured in terms of kilometers between the markets
2. Size of markets: larger markets are generally more efficient in pricing than smaller ones
3. Age of markets: this is measured in terms of the number of years from its establishment. Markets which are older are usually more efficient than the newly established ones
4. Number of wholesalers or traders: their number in a particular market indicates the degree of competition in it.
5. Concentration of market power: if the trade is concentrated with a few traders, the efficiency of the market may be low, even if the number of traders is large
6. Availability of market information: this is the measure of the access of traders to information from other markets. The larger the number of telephones, the better the market information system and the more efficient the pricing efficiency.

Intra Year Pricing Efficiency

Within a year itself, the price of a commodity rises depending on the availability of the same. Storage of the commodity comes into this picture and the cost of storage increases. The extent to which intra year price rise corresponds with the storage cost indicates the intrayear pricing efficiency. The higher the correspondence between the intrayear price rise and storage cost, the higher the pricing efficiency and viceversa. In a price efficient market, the following relationship should hold good.

$$P_{t+1} - P_{t} = S$$

P_t = price in period t

P_{t+1} = price in period t+1

S = Storage cost for one period including the interest charges on the value of the produce stored

If the difference in the prices at two points of time during a year corresponds with the cost of storage, the intra-year pricing efficiency is high. Intra-year price difference can be studied between seasons or months and they are called as the inter-seasonal or inter-month price differentials. Inter-seasonal price differential can be defined as the difference in average price during the post harvest season and the average price in a later season. In the case of fish and fishery products also, the above phenomenon holds good.

Storage cost and returns to storage:

The storage cost for each season or month of the year from the post harvest

season or month onwards is calculated by adding the various cost components like handling cost, transport cost, rent for the warehouse and quantitative and qualitative losses during the storage period. The price differentials and the cost of storage are compared to know whether the seasonal price rise or monthly price rise is more or less than the storage cost. The amount by which the increase in the price from the post harvest season or month to a particular season or month exceeds the cost of storage for the intervening period is called returns to storage. It is calculated as follows:

$$RS = (Pi - (Pt + C))$$

Where

RS = returns to storage
Pi = price of the commodity in period t
Pt = price of the commodity in post harvest period t
C = storage cost from period t to i
t to i= storage interval
Returns to storage is positive if Pi > (Pt + C) and negative if Pi < (Pt +C)

Pricing efficiency in commodities involving processing

Usually for export, the raw materials i.e. the fishes are processed and then packed. The processing includes beheading, gutting, cleaning etc and depending upon the demand of the foreign consumer, different product styles are made. Although processing adds form and utility, it also adds to the cost. The extent to which the difference in the prices of the unprocessed and the processed product deviates from the cost of processing provides yet another dimension of the pricing efficiency of the system. Price differential due to the form of the product is the difference in the price of the processed product and that of the raw material. The quantity of the processed product is smaller than that of the raw material as some by-products are obtained in the processing function. For example in the manufacture of fishmeal, fish oil is a byproduct and hence the value of the byproduct should also be accounted for in comparing the price difference and the processing cost. Processing cost is the sum total of all the fixed and variable costs involved in the processing of the product: depreciation, interest on investment, labor, fuel, electricity cost loss in quantity and the chemicals used in processing

Pricing efficiency and restrictive trade practices

The approaches presented above provide a very limited view of pricing efficiency. The price quotations reflect only the price levels within the current policy frame. Government intervention in the form of fiscal, monetary, and regulatory policies affect prices. In this case, the analysis of pricing efficiency of the marketing system through these approaches is blurred by government intervention. The pricing in the domestic as well as the global market will behave differently according to the government intervention. Sometimes the government may impart restrictions / barriers in the movement of the commodity and

hence it is necessary to have a comparison of prices in the domestic market with those in the global market after accounting for the transportation costs. If the country is a surplus producer of shrimps or fishes and if the exports are not permitted, then the prices in the domestic market remain at levels lower than the levels, which would have prevailed otherwise. If the country is deficit in any of the commodity and if imports are not permitted, then the prices in the domestic market remain higher than what would have been the case otherwise. So as a result of the restrictions, prices in the domestic market remain at levels different than those in the global market even after accounting for the transportation costs

Demand And Price Analysis

Demand means the quantity of a product or service which the buyers will purchase at different prices in a given market at a given time. The different elements here are the quantities, the prices, the ability of the purchaser, the market situation and the time frame. Usually when the price of the commodity increases the quantity demanded decreases and vice versa, and this constitutes the law of demand. The tabular expression of demand is termed the demand schedule, the graphical expression-demand curve and the algebraic expression - the demand equation. The various aspects pertaining to demand have been discussed in an earlier chapter.

Demand projection and price forecasting

In most developing countries, demand for farm products increases continuously due to increase in population and per capita income. The simplest way to estimate the rate of growth of demand for any farm product is to use the following expression

$$D^1 = P^1 + á\ (Y/P)$$

Where

D^1 = rate of growth in demand
P^1 = rate of growth in population
(Y/P) = rate of growth in per capita income
á = income elasticity of demand

Basic Nerlovian Price Expectation Model and Acreage Adjustment Models:

These models were initially suggested and used by Nerlove to estimate the effects of prices on the acreage under crops. In the price expectation model, it was hypothesised that farmers would react not only to the last year's prices but to the price they expected, and this expected price would depend only to a limited extent on last year's price was. This model is known as the Nerlovian price Expectation Model and is of the following form:

$$A_t = a + bP^*_t + U_t \quad \text{.....(1)}$$

$$P_1^* - P^*_{t-1} = b(P_{t-1} - P^*_{t-1}) \quad \text{.....(2)}$$

$$0 < b < 1$$

Where

$A_{t=}$ Actual acreage in year 't'
$P^*_{t=}$ Expected price of the crop in the year 't'
P^*_{t-1} = Expected price of the crop in the preceeding year
P_{t-1} = Actual price of the crop in '$_{t-1}$.
U_t = Error term
a & b = constants
b = Coefficient of expectation

Other workers modified the Nerlovian model of price. Rainfall, relative yield and total irrigated area in the first equation of basic Nerlovian model was included as the explanatory variables to explain the variation in acreage. Further Berhman added the price variability as one of the independent variables in the basic Nerlovian model as a measure of uncertainty in the price.

In the acreage adjustment model, the hypothesis is that the desired acreage (At*) depends on last year's is (Pt-1) and that the acreage adjustment from one year to another depends on the difference between last year's acreage (A*t-1) and the desire area for the current year (A*t).The two equation acreage adjustment model can be expressed as:

$A^*_t = a + bP_{t-1} + U_t$
$A_t - A_{t-1} = Y (A^*_t - A_{t-1})$
$0<Y<1$

Where a, b and the coefficient of adjustment (Y) are the parameters to be estimated. Both the price expectation and acreage models lead to the same form of the estimating equation, which is given below:

$A_t = P_0 + P_1 P_{t-1} + P_2 A_{t-1} + Wt$

Where

P_0 = ab (or) ay
P_1 = bb (or) by
P_2 = 1 - b (or) 1-y
Wt = New disturbance term

The relationship of the new disturbance term in estimating (reduced form) equation and the structural equations and the corresponding assumptions about the behaviour of these terms specially in respect of autocorrelation differ between the price expectation and acreage adjustment models.

Price behaviour of marine fish in India

Demand and price of marine fish are continuously in our domestic markets. The increase in fish prices over the years is even higher than the increase in food grain prices. For e.g. the average wholesale price of seer fish increased from Rs. 4/kg during 1973-

74 to Rs. 80/kg during 1996-97 recording an increase of 15 times during the last 23 years. Seer fish commanded the highest wholesale price till 1993-94 in the internal marketing system but it has now been replaced by pomfrets. Maximum increase in retail price was observed for pomfrets, followed by seer fish and barracudas.

Very wide seasonal variation has been seen in the prices of different varieties of fish in primary, wholesale and retail markets. There is also considerable variation in the price of the same variety of fish between different regions. This is mainly due to the change in consumer preference of different varieties and also due to the difference in the size of the fish.

Fishermen's share in consumer rupee is the best index to measure the efficiency of fish marketing system. At an all India level, fishermen received an average of 30%[silver bellies] to 60% [seer fish] of consumer rupee for different varieties of fish. The general trend of fishermen's share in consumer rupee for different varieties of fish in various states indicates that the fish marketing system is comparatively efficient in Gujarat and Maharashtra while less efficient in Karnataka and Andhra Pradesh.

The marketing margin is an indicator of the marketing efficiency. In the absence of any value added process, higher the value of marketing margin, lower the efficiency of the system. The marketing margin for various varieties of fish and its percentage distribution pattern towards marketing cost, wholesaler's and retailer's margin is furnished in table 15.5.

Table: 15.1 Wholesale price behaviour of marine fish in India [Rs. /kg]

Average price

Name of fish	1973-74	1984-85	1989-90	1993-94	1996-97
Seer fish	4.00	19.00	28.90	58.00	60.00
Pomfret	2.00	17.50	15.20	35.00	70.00
Barracudas	2.00	11.25	15.20	30.00	35.00
Tuna	2.00	10.00	13.45	30.00	32.00
Sharks	1.50	11.25	13.85	26.00	28.00
Catfish	1.00	7.57	13.00	20.00	24.00
Mackeral	2.00	6.25	9.00	16.00	18.00
Sardines	1.00	4.00	6.90	13.00	15.00
Ribbon fish	2.00	5.00	6.15	10.00	13.00
Whitebaits	2.00	5.00	5.85	15.00	15.00
Rays	1.0	6.00	6.40	12.00	15.00

Table:15.2 Retail price behaviour of selected varieties of marine fish in India[Rs./kg]

Name of fish	Average retail price				
	1973-74	1984-85	1989-90	1993-94	1996-97
Seer fish	9.00	27.00	35.50	66.00	70.00
Pomfret	2.50	22.00	29.50	35.00	96.00
Barracudas	2.50	15.35	21.00	35.00	45.00
Tuna	3.00	16.50	18.50	39.00	40.00
Sharks	2.50	17.00	17.00	31.00	35.00
Catfish	2.50	11.00	16.50	30.00	36.00
Mackeral	3.00	9.85	12.50	25.00	28.00
Sardines	2.00	6.70	10.00	16.00	24.00
Whitebaits	3.00	8.00	9.00	18.00	20.00
Ribbon fish	2.50	8.50	10.00	19.00	21.00
Rays	2.00	10.00	10.75	15.00	19.00

Table: 15.3 Average [1996-97] primary, wholesale and retail prices [Rs./kg] of selected varieties of marine fish in India

Name of fish	Landing center	Wholesale	Retail price
Seer fish	48	60	70
Pomfret	58	70	96
Barracudas	18	35	45
Tuna	18	32	40
Sharks	15	28	35
Catfish	20	24	36
Mackeral	14	18	28
Sardines	8	15	24
Ribbon fish	10	13	21
Rays	9	15	19
Whitebaits	8	15	20
Lizard fish	6	9	17
Goat fish	12	17	21
Thread fins	13	22	31
Croakers	10	15	21
Silver bellies	6	10	20
Big jawed jumper	21	26	38
Mullets	14	22	34
Half and full beaks	15	19	23
Cephalopods	22	27	34

Table:15.4 Fishermen's share (%) in consumers rupee for selected varieties of fish in different maritime States (1996-97)

Name of fish	Guj.	Mah.	Kar.	Kerala	T.Nadu	A.P.	All India
Seer fish	71	81	40	65	49	49	68
Pomfret	64	68	46	43	51	53	60
Barracudas	36	55	53	54	24	40	-
Tuna	63	43		51	60	36	45
Sharks	45	36	40	63	60	17	43
Catfish	37	76	35	58	63	33	56
Mackeral	50	50	33	50	55	26	50
Sardines	60	57	54	43	63	58	33
Ribbon fish	83	60	41	37	55	36	48
Rays	-	-	-	30	57	40	47
Whitebaits	-	-	33	26	48	22	40
Lizard fish	44	43	31	30	53	36	35
Goat fish	-	-	-	60	60	42	57
Thread fins	43	-	-	-	53	23	42
Croakers	56	54	38	31	63	27	48
Silver bellies	-	-	-	35	32	21	30
Big jawed jumper	-	-	60	45	67	44	55
Mullets	-	45	42	59	46	38	41
Half and full beaks	-	-	61		65	-	65
Cephalopods	63	75	71	71	51	44	65

Table:15.5 Percentage distribution of consumers' rupee for different verities of marine fish of India (1996 –97)

Name of fish	Fishermen	Handling& Transportation	Wholesalers	Retailers
Seer fish	68	6	12	14
Pomfret	60	7	9	24
Barracudas	40	9	30	21
Tuna	45	9	28	18
Sharks	43	10	32	15
Catfish	56	10	10	24
Mackeral	50	9	11	30
Sardines	33	12	23	32
Ribbon fish	48	10	12	30
Rays	47	13	22	28
Whitebaits	40	12	28	20
Lizard fish	35	12	15	38
Goat fish	57	13	16	14
Thread fins	42	9	20	29
Croakers	48	11	14	27
Silver bellies	30	15	8	47
Big jawed jumper	55	10	9	26
Mullets	41	9	17	33
Half and full beaks	65	9	10	16
Cephalopods	65	10	5	20

*Source of tables: Marine Fisheries Research and Management, CMFRI 2000.

CHAPTER XVI

THE PRICE INDEX NUMBER

Introduction

The price index measures the cost of a given combination of goods and services in one year as compared to some earlier "base year". The combination of goods and services is called a "market basket" and reflects the countries average consumption and production pattern. There might be several consumer price indices such as food, housing apparels and upkeep, transportation, medical care, personal care, reading and recreation and all other goods. To calculate a cost of living index number is a very complicated, costly and difficult task involving many technical decisions: such an index number must take into consideration all the important goods and services bought by thousands of customers in many sites. The purchasing power of the rupee is constantly changing over the short run these changes may be small, but over a long period of time they can be substantial. If a series such as wage rate is divided by its equivalent "cost of living" index for each period, the resulting series is set to expressed in constant rupees. So, the price index number is used to measure the changes of price for a particular time period.

Price index numbers

Index numbers

Index numbers are devices for measuring differences in the magnitude of a variable of group of variables at different points of time or location.

Price index number

A price index number for a commodity or group of commodities is the price of the commodity (or group) at a given point of time expressed as a percentage of prices in some base period.

Price relative

The concept of price index number when applied to an individual product is termed as the price relative. A price relative is defined as a ratio of prices of an individual product to its price in the base (or reference) period expressed in percentage terms. The price relative is expressed as

$$I_t = Pt/Po \times 100$$

Where

I_t- The price relative for period t
P_t- Price in period t and
Po- The price in the base period.

Advantages: -

There are four main advantages in using index numbers.

1. An index number straight away indicates the extent of price change in relation to the base period. The direct indication is not the possible when the raw price is looked at.
2. The price index number can easily reveal the change in price level of a group of commodities taken together. This is not easy when raw prices are used.
3. The price index number instantaneously indicates the differential change in price of more than one commodity.
4. There are quite a few commodities whose prices are expressed in different units.

Construction of price index numbers

Construction of price index numbers is undertaken with the objective of monitoring changes in prices of various commodities, individually or in groups. The groups of commodities for which usually price changes need to be watched are all fisheries products, farm inputs, consumer goods on which laborers or non-manual employees spend their incomes, and prices of manufacture goods. Quite often the index numbers for various groups are constructed for prices at different stages of marketing i.e. farm, wholesale retail. The selection of commodities included in each group, the weighs assigned and the type and sources of data depend on the objective of the specific index number series. The selection of the base period and the method of averaging individual commodity price relatives deserve special attention.

1. Selection of base period

The base period is the reference period for comparison of prices. The price of the base period is treated as 100 for the construction of index numbers. An Index numbers are used to serve many objectives having far-reacting consequences on the economy and welfare of the people, the base period is very carefully selected.

In general, the base period should be a normal period - "normal" in relation to the activities, which affect prices month, is ordinarily too short a period to use as a base period. Quite often, a year is used. But there are dangers because no single year is sufficiently 'normal' to be a good base. Therefore a two to three period or average of two to three years is generally a better base period for index construction. The base period chosen for the construction of price index number should meet the following requirements.

1. It should represent at least one complete production process to avoid seasonal price variation affecting base period price.
2. It should be a normal period in terms of production and yields.
3. It should represent normal conditions in the economy.
4. It should be sufficiently long so that year-to-year variations in prices are cancelled in base period.

The base period should be more recent period. The main reasons for changing the base to a more recent period are as follows:

1. The number and list of commodities consisting the group for which the price index number is being constructed change overtime.
2. The weight age of individual commodities in the group index number under goes a change overtimes.
3. Permanent devaluation of currency, growth in population and technological developments lead to new levels of prices, income, production and consumption, which require bringing the base of price index numbers to a more recent period.
4. The quality and variety of many items included in the index number change progressively overtime and this necessitates up gradation of the base period.
5. If a major program of economic development is introduced in the country, the base period has to be changed to bring it near the commencement period with a view to assessing its impact on the price situation in ensuing years.
6. Even if nothing has changed, comparison of the current price level with distant past is less meaningful. Hence, the base period needs to be changed.

2. Price index or Price Relative for an individual commodity

Price relative or index for an individual commodity can be calculated by the following formula:

$I_t = P_t / Po \times 100.$

3. Price index for a group of commodities

Simple average of price relatives:

In this method each commodity or input is assigned equal weight logically, the weight for each commodity should be different.

Construction of price index number by this simple method can be done by any of the following approaches.

1. Calculate the price relative for each commodity period and calculate their simple average for each year.
2. Calculate the sum of all these prices for each year and compute the index number.

The formula for construction of price index for a group of commodities by this method is as follows.

$$I_t = 1/n \sum_{i=1}^{n} I_{it}$$

Where,

I_t-The group price index number for period t

I_{it}-The price relative of 'i th commodity for period t

n-The number of commodities in the group.

4. Weighted methods of construction of index numbers

These methods allow the price of each commodity in the group to have a reasonable influence on the aggregate price index Each commodity in the group is assigned a predetermined logical to work out the group price index.

There are two approaches to construct price index numbers for a group of commodities, when each commodity is to be assigned a different weight:

1. Weighted relative method.
2. Weighted aggregative method.

Weighted relative method

The steps involved in this method are,

1. To workout the price relative for each commodity in the group and
2. To calculate the weighed average of these price relatives that is the price index number of the group.

The general formula to work out the price index number for a group of commodities by the weighed relative method is as follows:

$$It = \frac{\sum_{i=1}^{n} I_{it} W_i}{\sum_{i=1}^{n} W_i} \quad (or) \quad \sum_{i=1}^{n} I_{it} w_i$$

Where,

I_t- The index number of prices of the group for period t.

I_{it}-The price relative for 'i'th commodity for period t

W_i- The absolute weight for 'i'th commodity

wi-The relative weight of ith commodity defined as Wi + wi

n- The number of commodities in the group.

Weighted Aggregative method:

In this method, the price index for a group of commodities is constructed via price

relatives for individual commodities. Alternatively one can construct the price index number for a group of commodities using raw prices. The steps involved in this method are

a. To work out the weighted sum (or average) of prices for the base year as well as the year for which price change is to be measured and

b. To express the weighted sum (or average) of prices for the current year as percentage of weighted sum (or average) of prices for the base year which is the index number of a group of commodities. The formula for this method is as follows

$$I_t = \sum_{i=1}^{n} P_{it} W / \sum_{i=1}^{n} P_{io} W_i \times 100 \quad \text{(or)} \quad \sum_{i=1}^{n} P_{it} W_i + \sum_{i=1}^{n} W_i / \sum_{i=1}^{n} P_{io} W_i + \sum_{i=1}^{n} W_i$$

Where, I_t-The group price index number for period t
P_{it} –The price of i^{th} commodity in the period t
P_{io}-The price of i^{th} commodity in the base period
Wi-The weight assigned to i^{th} commodity (the same weight in the base as well as t^{th} period).
n-The number of commodities in the group.

5. Selection of weights

The selection of weights is guided by two considerations the objective that the index number is expected to serve and whether raw prices or price relatives are used for construction of index numbers.

If the objective of construction of price index number for a group of commodities is to measure the change in aggregate value of a specific basket of commodities in a year as compared to the base year. One may operate with raw prices of commodities and use quantities of each commodity in the basket as weights. When these weights remain the same for the base period and the period for which comparison is to be made the change in aggregate value of commodities (product of prices and respective quantities) is only due to price change, but quite often, the analyst is interested in measuring the change in price of individual commodities as well as the group as a whole. Usually therefore price index numbers for sub–groups of commodities by assigning appropriate weights.

Whenever, price relatives are used for construction of price index numbers for sub-groups or groups of commodities it is advisable to use relative values as weights.

In the case of construction of index numbers of prices paid by farmers the shares of purchased inputs in the total cost of production or cost of utilization are used as weights.

Similarly in constructing the index number of cost of living, the proposition of expenditure on individual items to total consumption expenditure of the target group is used as a weight.

In the process of averaging, the importance of selection of appropriate weights is very high because the price change which the group index purpose to measure varies from commodity to commodity. Faculty choice of weights is likely to mislead the users of index numbers. Quite often it is necessary to launch specific surveys to determine the weights.

There is one other aspect, whether the weights selected are quantities of production of production, quantities of goods transacted, shares in cost of production or shares in consumption expenditure, there is the issue of the period to which these weights pertain. For example, in the case of farm harvest price index, should the relative values of marketed surplus which are used, as weights be of the base year, current year, some average of these two or of others. And are calculated by-

1. Lespeyres' method:

In this method, base period quantities (production or transactions) are used as weights.

The formula for index number is

$$I_t = \sum_{i=1}^{n} Pit\ qio / \sum_{i=1}^{n} Pio\ qio \times 100$$

Where,

I_t - The aggregative price index for period t
P_{it}- The prices of 'i'th commodity in 't'th period.
P_{io}- The prices of base period.
q_{io}- The quantity of 'i'th commodity in the base period

Alternatively the same result can be obtained by the weighted relative method when the weighted average of price relative is obtained, using base year values (base year quantities x base year prices) as weights. The formula for obtaining the index number through price relative is

$$I_t = \frac{\sum (P_{it}/P_{io}) P_{io}\ q_{io}}{\sum P_{io}\ q_{io}} \times 100$$

2. Passche's method

In this method, current period quantities are used as weights. The weight for each period that is different .The index is defined by the following formula:

$$I_t = \frac{\sum P_{it}\ q_{it}}{\sum P_{io}\ q_{it}} \times 100$$

Where,

I_t, P_{it} and P_{io} have the same meaning as mentioned in the above formula,

q_{it}= The quantity of ith commodity in t th period

The formula for construction of index number by using weighted price relatives, the weights being of production of the current or given year at base period prices is as follows:

$$I_t = \frac{\sum [P_{it}/P_{io}]P_{io}\, q_{it}}{q_i \sum P_{io}} \times 100$$

Where,

I_t,P_{it} ,P_{io},q_{it} have the same meaning as mentioned above .

3. Marshall-Edge Worth method

This is another method of weighing in construction of aggregative price index numbers. Under this method, either the average of total of quantities of base and current periods are used as weights. The formula for constructing aggregative price index is as follows:

$$I_t = \frac{\sum_{i=1}^{n} P_{it}(q_{it}+q_{io})}{\sum_{i=1}^{n} P_{io}(q_{it}+q_{io})} \times 100$$

The formula for calculating index number through price relatives is as follows:

$$I_t = \frac{\sum [P_{it}/P_{io}](q_{it}+q_{io})P_{io}}{\sum (q_{it}+q_{io})P_{io}} \times 100$$

Where,

All notations have the same meaning as mentioned above.

4. Average quantity method:

In this method, average of the quantities for all the periods are used as weights. The formula for all the periods are used as weight .The formula for aggregative price index is as follows:

$$I_t = \frac{\sum_{i=1}^{n} P_{it}\, q_i}{\sum_{i=1}^{n} P_{io}\, q_i} \times 100$$

Where,

q_i - The arithmetic mean of the quantity of i^{th} commodity($\sum_{i=1}^{n} q_{it}^{th}$)

The formula for calculating index number by weighted price method is as follows.

$$I_t = \frac{\sum[P_{it}/P_{io}]q_i P_{io}}{\sum q_i P_{io}} \times 100$$

Where,

p_{it}/P_{io} -The price relative for period 't'

$q_i P_{io}$ - The value of average quantity at base period prices for i^{th} commodity.

5. Typical periods average quantity (TPAO) method

This method of weighing involves selecting a few typical years and using average quantities and values of these typical years as weight .The formula for construction of aggregative price index number is as follows.

$$I_t = \frac{\sum_{i=1}^{n} P_{it} q_{ip}}{\sum_{i=1}^{n} P_{io} q_{ip}} \times 100 \text{ (or) } \frac{\sum_{i=1}^{n}[P_{it}/P_{io}]P_{io} q_{ip}}{\sum_{i=1}^{n} P_{io} q_{ip}}$$

Where,

q_{ip}- The average quantity of 'i'th commodity for the selected typical period.

P_{it}/P_{io}- The price relative for 'i'th period

$P_{io} q_{ip}$ - The value, at base period prices of average quantity for typical period /years.

6. Fisher's method

According to this method, two index numbers for each period are constructed using two different systems of weights and a geometric mean of the two is considered as the price index number. Usually base period and current period quantities are used as the two systems of weights.

The fisher's index is as follows.

Fisher's index number for year t = $\sqrt{\text{(Lespeyres' index number) (Passche's index number)}}$

Weighted aggregative chain index numbers

In this method, the prices for each period are first expressed as percentages of the prices of the previous period. These percentages are then linked together by successive multiplication to form a chain index.

If a weighing system is to be used, the weighted sums of prices for each year are computed and each sum is expressed as a percentage of the sum for the proceeding year.

The advantages of using the chain method are,

1. If some commodities are formed to be irrelevant, they can be dropped.
2. If new commodities need to be introduced, this can be done; and
3. The weights can be changed.

The disadvantage of using the chain method is that while year-to-year comparisons are not strictly valid.

Two types of price index:

1. Consumer price index (CPI)

CPI is a measure of the average level of prices for commodities purchased by a moderate-income urban family. The CPI is derived from weighing current prices by the average quantities of goods and services purchased in the base year.

a) **Consumer price index for aquaculture labourers:** It is used to measure changes in the level of retail prices of a fixed basket of goods services on which agricultural labourers in the county spend their income.

b) **Consumer price index for non-manual employee middle class:** It is used to measure the changes in the level of retail prices of a fixed basket of commodities on which urban non-manual or middle class employees spend their income.

2. The wholesale price index (WPI):

WPI is the index of price charged for goods sold in primary wholesale markets. Wholesale markets refer to basic goods produced in manufacturing agriculture, forestry, fisheries, mining and electric and utilities. As with the CPI, the WPI is in percentage terms relative to some base time period.

Conclusion:

The price index numbers are used to measure changes that have taken place from one time period to another, combine changes in several series and devalue a time series in terms of constant rupees and also it is used to measure the inflation rate and real income. Two important problems affect the accuracy of price indexes as measure of price change, one stem from buyer's reaction to price changes and the other from quality improvements and new products.

Table: 16.1 Price Relative

Commodity	Price (Rs./100 Kg)		Price relative	
	1990-1991	2000-2001	1990-1991	2000-2001
Carps	2700	2943	100	109
Catfish	7500	9300	100	124
Murrel	10000	17100	100	171

The price index number (base1990-91=100) of carp is 109.It indicates that the price of carp on 2000-01 is 9% higher than that in 1990-91. Which is the base period thus the importance of price index number lies in that, it reflects the change in price with respect to some base period. The price index number must accompany the information on the base period.

Table: 16.2 Lespeyres' Method

Goods	Price (Rs./100 Kg)		prod. in the base period 90-91 (mt)	value of prod.in 90-91 at prices of		Price relative of 00-01 weighted by 90-91 value of
	90-91	00-01		90-91	00-01	
Carps	2700	2943	1.8	4860	5297.4	5297.4
Catfish	7500	9300	0.04	300	372	372
Murrel	10000	17100	0.01	100	171	171
	Total			5260	5840.4	5840.4

$$I_1 = \frac{5840.4}{5260} C \ 100$$

$$= 111.03$$

Table: 16.3 Passche's Method

Goods	Price (Rs./100 Kg)		prod. in the 00-01 (mt)	value of prod. in 00-01 at prices of		Price relative of 00-01 weighted by 90-91 value of
	90-91	00-01		90-91	00-01	
Carps	2700	2943	2.8	7560	8240.4	8240.4
Catfish	7500	9300	0.12	900	1116	1116
Murrel	10000	17100	0.04	400	684	684
	Total			8860	10040.4	10040.4

$$I_t = \frac{10040.4}{8860} C\ 100$$

$$= 113.32$$

Table: 16.4 Marshall-Edgeworth Method

Goods	Price (Rs./100 Kg)		Total prod. Of 90-91&00-01 (mt)	Total value of prod. of 90-91 & 00-01 at prices of		Price relative of 00-01 weighted by 90-91 value of
	90-91	00-01		90-91	00-01	
Carps	2700	2943	4.6	12420	13537.8	13537.8
Catfish	7500	9300	0.16	1200	1488	1488
Murrel	10000	17100	0.05	500	855	855
	Total			14120	15880.8	15880.8

$$I_t = \frac{15880.8}{14120} C\ 100$$

$$= 112.47$$

Table: 16.5 Average Quantity Method

Goods	Price (Rs./100 Kg)		Average prod. For 90-91-00-01 (mt)	value of Avg. prod for 90-91 - 00-01 at prices of		Price relative of 00-01 weighted by Avg. Prod. at 90-91 prices
	90-91	00-01		90-91	00-01	
Carps	2700	2943	2.3	6210	6768.9	6768.9
Catfish	7500	9300	0.06	450	558	558
Murrel	10000	17100	0.025	250	4275	4275
	Total			6910	7754.4	7754.4

$$I_t = \frac{7754.4}{6910} C\ 100$$

$$= 112.21$$

Table: 16.6 Typical Periods Average Quantity (TPAO) Method

Goods	Price (Rs./100 Kg)		Average prod. For 90-91- 93-94 (mt)	Value of Avg. prod. for 3 years 90-91 - 93-94 at prices of		Price relative of 00-01 weighted by value of 3 years Avg. quantity at 90-91 prices
	90-91	00-01		90-91	00-01	
Carps	2700	2943	1.9	5130	5591.7	5591.7
Catfish	7500	9300	0.05	375	465	465
Murrel	10000	17100	0.015	150	256.5	256.5
	Total			5655	6313.2	6313.2

$$I_t = \frac{6313.2}{5655} \quad C \quad 100$$

$$= 111.64$$

Fisher's method

$$I_t = \text{(Lesperyer's index for year t . Passche's for year t)}^{1/2}$$

$$= \sqrt{(111.03)(113.32)}$$

$$= 112.17$$

Table: 16.7 Weighted Aggregative Chain Index Number

Year	Price/100Kg			Price (mt)			Price C Prod. In first of year of each pair				% of preceding year of each year	Chain Index
	Major Carps	Exotic	Murrel Carps	Major	Exotic Carps	Murrel Carps	Major	Exotic Carps	Murrel Carps	Total		
93-94	2500	2000	7000	1.12	0.20	0.09	2800	400	630	3830	100.00	100.00
94-95	2600	1800	7500				2912	360	675	3947	103.05	103.05
94-95	2600	1800	7500	1.20	0.21	0.09	3120	370	675	4165	100.00	-
95-96	2800	2200	7800				3360	462	702	4524	108.62	111.93
95-96	2800	2200	7800	1.35	0.24	0.094	3700	528	733	4961	100.00	-
96-97	3000	2500	8000				4050	600	752	5402	108.89	121.88
96-97	3000	2500	8000	1.40	0.26	0.11	4200	650	880	5730	100.00	-
97-98	3500	2550	8500				4900	663	935	6498	113.40	138.22
97-98	3500	2550	8500	1.511	0.24	0.11	5250	600	935	6785	100.00	-
98-99	3600	2600	8550				5400	624	941	6965	102.65	141.88

1993-94=100
1994-95=103.05% of 100=103.05
1995-96=108.62% of 103.05=111.93
1996-97=108.89% of 111.93=121.88
1997-98=113.40% of 121.88=138.22
1998-99=102.65% of 138.22=141.88

Table: 16.8 Consumer Price Index Number

Market basket		Base year 1993-1994		Current year 1998-1999	
Goods	Quantity (mt) (Rs./100Kg)	Price	Expenditure	Price	Expenditure (Rs./100Kg)
Major Carps	1.511	2500	3777.50	3600	5439.60
Exotic Carps	0.240	2000	480.00	2600	624.00
Murrel	0.11	7000	770.00	8550	940.40
Total			5027.5		7004

$$CPI = \frac{7004}{5027.5} C\ 100$$

$$= 139.3$$

Table: 16.9 Whole Sale Price Index

YEAR	Whole Sale Price Index
1979	25.5
1980	30.6
1981	34.3
Base 1995-100	
1982	35.10
1983	37.90
1984	40.50
1985	43.40
1986	44.80
1987	47.90
1988	52.10
1989	55.60
1990	60.60
1991	60.80
1992	77.00
1993	82.70
1994	91.50
1995	100
1996	105.90
1997	111.40
1998	119.10
1999	123.30
2000	126.38
2001	133.36
2002	136.68

CHAPTER XVII

MARKET AND MARKETING STRUCTURE

Introduction

The word market comes from Latin word 'marcates' that means 'trade' or 'a place' where business is conducted.

Word 'market' has been widely and variedly used to mean: -

- A place or building where commodities are brought & sold. Eg: super market.
- Potential buyers and sellers of product. Eg: wheat or cotton market.
- Potential buyers and sellers of a country or region. Eg: Indian market or Asian market.
- An organization, which provide facilities for exchange of commodities. Eg: Mumbai stock exchange.
- A phase of commercial activity. Eg: Dull or bright market
- The studies of the market structure for fish and fish products have concentrated mainly on marine or seafood industry.

Other terms used for describing markets in India are H*ats, Painths & Bazaar.*

Marketing can be defined as:

- A market is an area within which the, forces of demand and supply converge to establish a single price.
- The term market means not a particular market place in which things are brought & sold but the whole of any region in which buyers and sellers are in such a free intercourse with one another that the prices of the some goods tend to equality, easily & quickly.
- Marketing for aquaculture products can be defined, as Aquaculture "Marketing is the performance of all business activities involved in the flow of aqua cultural products and services from the point of initial aquacultural production until they are in the hands of consumer.

Marketing begins on farm and ends with satisfied consumer.

A market may be defined by:

A. A location: Newyork fish market.

B. A product: The shrimp market.

C. A time: September-October catfish market.

D. A level: Retail market.

Marketing makes goods and services useful. *The utilities created by market are:*

a. Place: The transfer of fish from farm gate to supermarket.

b. Time: The over wintering of live fish or storage of processed fish products.

c. Form: The transformation of fish into fish steaks and

d. Procession: The consignment of fish from wholesaler to retailer.

Components of a market:

For a market to exist, certain conditions must be satisfied. These conditions are termed as components of market:

1. The existence of good and or commodities for transactions (Physical existence is however, not necessary)

2. The existence of buyers and sellers

3. Business relationship or intercourse between buyer's and sellers and

4. Demarcation of area such as place, region, country or the whole world.

The existence of perfect competition or a uniform price is not necessary.

Dimensions of a market:

These are various dimensions of any existence market:

A. Location.

B. Area or coverage.

C. Time span.

D. Volume of transactions.

E. Nature of transactions

F. Number of commodities.

G. Degree of competition.

H. Nature of commodities.

I. Stage of marketing

J. Extent of public intervention.

Classification of markets:

An individual market may be classified as a ten dimensional space and is as follows:

A. On the basis of Location or Operation:

a. Village market: A market, which is located in small village, where major transactions take place among the buyers buyer's or seller's of a village is called as village market.

b. Primary wholesale market: These markets are located in big cities near the center of production of agriculture commodities. Here, sellers are producer-farmers themselves and transaction between farmer and traders.

c. Secondary wholesale market: These markets are located generally in district head quarters or important trade center. Major transactions of commodities in between village traders and wholesellers. Bulk of arrival in these markets from another market.

d. Terminal market: In a terminal market produce is either finally disposed of to the consumers or processors, or assembled for export. These markets are located either in metropolitan cities or in sea-ports –in Mumbai, Chennai, Culcutta & Delhi

e. Seaboards markets: Markets, which are located near the seashore and are meant mainly for the imports or export. Eg: In India seaboard markets are Mumbai, Madras & Calcutta.

B. On the basis of Area/Coverage:

On the basis of the area from which buyers and sellers come for transactions.

a. Local or village markets: A market in which buying and selling activities are

confined among the buyers and sellers of same or near by villages. Eg: Local milk or vegetable market (mostly for perisible goods).

b. Regional markets: A market in which buyers and sellers for a commodity from a larger area than local markets. Eg; markets for food grains in India.

c. National market: A market in which buyers and sellers are at national level. Eg: Markets for durable goods like Jute and Tea.

d. World market: A marketing which buyers and sellers are drawn from whole world. These are the biggest market. Eg: Markets for Coffee, Machinery, Gold etc

C. On the basis of time span:

a. Short-period markets: These markets held only for few hours for highly perisible nature goods like Fish, fresh vegetable and liquid milk etc.

b. Long period markets: These marketed for longer period than the short period markets. Commodities traded in this market are less perisible and can be stored for some time .Eg: Food grains & Oil seeds.

c. Secular markets: These are markets of a permanent nature. Commodities traded are durable in nature & can be store for many years. Eg: markets for machinery and manufacture goods.

D. On the basis of Volume of Transactions:

(a) Wholesale market: It is one in which commodities are brought and sold in large lots or in bulk. Transaction mainly between traders.

(b) Retail markets: It is one in which commodities are brought and sold to the consumers as per their requirements in a small lot. Transaction between retailers and consumers.

E. On the basis of Nature of Transactions:

(a) Spot or cash markets: A markets in which goods are exchanged for money immediately after the sale is called spot or cash market.

(b) Forward market: Here, purchase and sale of commodity takes place at time 't' but exchange of commodity on specified date in future (t +1). Some time no exchange of commodities only deteffence in purchase and sale prices

are paid or taken.

F. On the basis of number of commodities in which transaction takes place:-

(a) General market: These market deal in large no of commodities. Eg: food grains, Oilseeds, fiber crops etc.

(b) Specialized market: A market in which transactions takes place only in one or two commodities is known as specialized market. Separate market exists for every group of commodities. Eg: vegetable market, wool market

G. On the basis of degree of competition:

(a) Perfect market: Perfect market have following conditions hold goods: -

i. There are large numbers of buyers and sellers;

ii. All the buyers and sellers have perfect knowledge of demand, supply and prices.

iii. Prices at any one time are uniform over a geographical area; plus or minus the cost of transportation.

iv. The prices are uniform at any one place over a period time; plus or minus the cost of storage.

v. The prices of different forms of a product are uniform, plus or minus the cost of processing.

(b) Imperfect market: These are the markets in which the conditions of perfect competition are lacking. They are again be classified depending on the degree of imperfection:

- Monopoly markets: only one seller in market.
- Duopoly markets: only two seller of commodity in market.
- Oligopoly markets: More than two but few sellers in market.
- Monopolistic competition: when a large number of sellers deal in heterogeneous and differentiated form of commodity, situation is called monopolistic competion. E.g.: market for fertilizers, insecticides etc.

Depending on imperfection in buyers:

- Monopsony markets
- Duopsony markets
- Oligopsony markets

H. On the basis of nature of commodities :

a. Commodity markets: These are the market which deal with the goods and raw materials

b. Capital markets: These are the markets, which deal with bonds, shares, ecurities etc.

I. On the basis of stage of marketing :

a. Producing markets: These are the markets, which assemble the commodities for further distribution to other markets and are generally located near the producing area.

b. Consuming markets: These are the markets, which collect the produce for final disposal to the final consumers.

J. On the basis of extent of public intervention:

a. Regulated market: Markets in which business is done in accordance with the rules & regulation formed by the statuary market organization and represents different sections involved in the market. The marketing cost in such markets is standardized and practices are regulated.

b. Unregulated markets: These are the markets in which the business is conducted without any set of rules & regulation. Traders frame the rules for the conduct of the business and run the market.

Growth of markets:

Following are the economic development of the society there is tendency to grow and this is known as market development or Growth.

This may be natural or induced. Market development takes place both quantatively & qualitatively. Two of the important dimensations for the growth of markets are: -

A. Functional growth:

a. First stage: General markets.

b. Second stage: Specialized markets

c. Third stage: Dealing with samples.

d. Fourth stage: Dealing with grades

B. Spatial/geographical growth:

a. First stage: Local markets.

b. Second stage: Regional markets

c. Third stage: National market

d. Fourth stage: International markets

Factors affecting the rate of market development:

a. Nature of demand

b. Nature of products.

c. Transportation and communication facilities

d. Quantum of supply &Demand

e. Public policies

f. Banking facilities

g. Peace and security.

Market structure:

The term market structure refers to the size and design of the market. It includes the manner of operation of the market. It also includes the manner of operation of the market. Some of its expressions are:

1. Market structure refers to those characteristics of the market that influence the nature of competition and pricing and affect the conduct of business firm.

2. Marker Structure refers to those characteristics of the market, which affect the traders' behavior and their performances.

3. Market structure is the formal organization of the functional activity of the marketing institution.

Component of the Market structure:

- Concentration of market power.
- Degree of product differentiation.
- Conditions for entry of firms in the market.

Market forces:

The key function of a market is to determine the price of the lot at which the product should change hands. This process goes on continually at all time and places between buyers and sellers. The forces, which affect the process of price determination, either directly or indirectly are called as market forces.

These forces may be tangible, like the announcement of a particular government.

Producer's surplus:

In any developing country, the producer's surplus plays a significant role. This is the quantity, which is actually made available to the non-producing population of the country. From the marketing point of view, this surplus is more important than the total production of commodities. The arrangements for marketing and the expansion of markets have to be made only for the surplus quantity available with the farmers and not for the total production.

The rate at which aquacultural production expands determines the pace of aquacultural development, while the growth in marketable surplus determines the pace of economic development. An increase in the production must be accompanied with an increase in the marketable surplus for the economic development of the country. The larger the production of a commodity the greater the surplus of that commodity and vice versa. In a planned economy the knowledge of marketed and marketable surplus helps the policy makers in the following are as:

1. Framing sound price policies
2. Developing proper procurement strategies: The procurement policy for feeding the public distribution system has to take into the quantum and behavior of marketable and marketed surplus.

3. Checking undue price fluctuations: A knowledge of the magnitude and extent of the surplus helps in the minimization of price fluctuations in commodities because it enables the authorities to make proper arrangements for the movement of produce from one area where they are in surplus to another area which is deficient.

4. Advanced estimates of the surpluses of such commodities, which have the potential of external trade, are useful in decisions related to the export and import of the commodity.

Meaning: The producer surplus is the quantity of produce, which is or can be made available by the farmers to non-farm population.

The producer surplus is of two types:

Marketable surplus:

The marketable surplus is that quantity of the produce, which can be made available to the non-farm population of country. It is a theoretical concept of surplus. The marketable surplus is the residual left with the producer-farmer after meeting his requirements for family consumption, payment to labour in kind, payment to landlord as rent and social and religious payment in kind. This may be expressed as follows:

Marketed surplus:

Marketed surplus is that quantity of produce, which the producer actually sells in the market irrespective of his requirements for family consumption and other requirements. The marked surplus may be more, less or equal to the marketable surplus.

An increase in the real income of farmers also has a positive effect on farm consumption because of positive elasticity. Since the contribution of this group to the total marketed quantity is not substantial. The overall effect of increase in production must lead to an increase in the marketed surplus.

Bansil writes that there is only one term- marketable surplus. This may be defined subjectively or objectively. Subjectively, the term marketable surplus refers to theoretical surplus available for sale with the producer after he has met his own genuine consumption requirements. Objectively the marketable surplus is the total quantity of arrivals in the market out of the new crop.

Relationship between marketed surplus and marketable surplus: -

The marketed surplus may be more, less or equal to the marketable surplus,

depending upon the condition of the farmer and of the crop. The relationship between the two terms may be stated as follows.

1. The marketed surplus is more than the marketable surplus when the farmer retains a smaller quantity of the crop than his actual requirements for family and f arm need. This is true especially of small and marginal farmers, whose need for cash is immediate. This situation of selling more than the marketable is termed as distress or forced sale. Such farmers generally buy the produce from the market in a later period to meet their family and/or farm requirements. The quantity of distress sale increases with the fall in the price of the product. A lower price means that a larger quantity will be sold to meet some fixed cash requirements.

2. Marketed surplus is less than the marketable surplus when the farmer retains some of the surplus produce. Large farmers generally sell less than the marketable surplus because of their better retention capacity. They retain extra produce in the hope that they would get a higher price in the later period.

3. Marketed surplus may be equal to the marketable surplus when the farmer neither retains more or less than his requirements. This holds true for perishable commodities and of the average farmer.

Factors affecting the marketable surplus:

The marketable surplus differs from region to region and within the same region, from crop to crop. It also varies from farm to farm. On a particular farm, the quantity of marketable surplus depends on the following factors.

1. Size of holding: there is a positive relationship between the size of the holding and marketable surplus.

2. Production: the higher the production the larger will be the marketable surplus and vice versa.

3. Price of the commodity: the price of the commodity and the marketable surplus has a positive as well as a negative relationship. Depending upon whether one considers the short and long run or the micro or macro levels.

4. Size of family: the larger the number of members in a family, the smaller the surplus on the farm.

The functional relationship between the marketed surplus of crop and factors affecting the

marketed surplus may be expressed as:

$$M = (X_1, X_2, X_3, X_4, \ldots\ldots\ldots Xn)$$

Where,

M =Total marketed surplus of a crop in tons

X_1= Size of the holding in acres and hectares

X_2 = Size of family in adult units

X_3 = Total production in tons

X_4 = Price of the crop

The other factors may be specified.

Marketing functions:

Any single activity performed in carrying a product from the point of its production to the ultimate consumer may be termed as marketing functions. A marketing function may have any one or combination of three dimensions viz., time, space, and form.

The marketing functions may be classified in various ways. For example, Thomson has classified the marketing functions into three broad groups. They are:

1.	**Primary functions:**	Assembling or procurement
		Processing
		Dispersion
2.	**Secondary functions:**	Packing or packaging
		Transportation
		Grading, Standardization, and quality control.
		Storage and warehousing
		Price determination or discovery
		Risk bearing
		Financing

		Buying and selling
		Demand creation
		Dissemination of market function
3.	**Tertiary functions:**	Banking
		Insurance
		Communications- posts and telegraphs
		Supply of energy –electricity

But Kohls and Uhl have classified marketing functions as follows:

·	**Physical functions:**	Storage and ware housing
		Processing
		Transportation
·	**Exchange functions:**	Buying
		Selling
·	**Facilitative functions:**	Standardization
		Financing
		Risk bearing
		Dissemination of market information

Converse, Huegy and Michael have classified marketing functions in a different way. According to them the classification is as follows:

·	**Physical movement functions:**	Storage
		Packing
		Transportation
		Grading
		Distribution

Ownership movement functions: Determining need

Creating demand

Finding buyers and sellers

Negotiation of price

Rendering advice

Transferring the title to goods

Market management functions: Formulating policies

Financing

Providing organization

Supervision

Accounting

Security information

Packaging:

Packaging is the first function done in the marketing of fish products. It is required for fish products at every stage of the marketing process. Packing means, the wrapping crating of goods before they are transported. Goods have to be packed either to preserve them or for delivering to buyers. Packaging is a part of packing the goods in small packages like bags, boxes, bottles, or parcels for sale to the ultimate consumers. In other words, it means putting goods on the market in the size and pack, which are convenient for the buyers.

Transportation:

Transport or the movement of goods between places is one of the most important functions at every stage i.e. right from the threshing floor to the point of consumption. Most of the goods are not consumed where they are produced. All fish products have to be brought from the place of production to the local markets and from there to the primary wholesale markets, secondary wholesale markets, retail markets, and ultimately to the consumers.

Transport is indispensable marketing function. Its importance has increased with

urbanization. For the development of trade in any commodity or in an area transport is a sinequanon. Trade and transport go side by side; the one reinforces and strengthens the other.

Advantages of transport function:

- Widening of the market
- Narrowing price difference over space
- Creation of employment
- Facilitation of specialized farming
- Transportation of the economy
- Mobility of the factors of production

Transportation cost:

The transportation cost accounts for about 50% of the total cost of marketing.

Factors affecting the cost of transportation:

- Distance
- Quality of the product
- Mode of transportation
- Condition of road
- Nature of products
- Availability of return journey consignment
- Risk associated

Grading and standardization:

Grading is the sorting of produce into different lots, each with substantially the same characteristics with respect to market quality and each bearing its own label or name. The purpose of grading is to help buyers to select the most suitable produce for the uses they have in mind, so that the goods command higher prices than otherwise they would.

Standardization implies the establishment of uniform quality specifications between place and place, between one time and another and between buyers and sellers as a basis for the grades. Grading loses much of its value in facilitating exchange if the same specifications are not observed in all sections of the market and at all times of the year. Effectively grading requires, therefore, that certain specifications be formulated in precise terms, be agreed upon and made known to all concerned.

Storage:

The storage of fish products over substantial periods of time is another service, which is essential because of the generally perishable characteristic of these goods, and the need to spread seasonally concentrated production over extended periods of relatively stable demand. The duration of storage may vary from few days to more than a year.

Bringing buyers and sellers together:

An essential marketing service is the bringing buyers and sellers together and facilitation of exchange. Two phases are involved: the marketing of possible buyers and sellers of particular products together at a given time, and the negotiation of the terms of exchange.

In many countries the town Market Square is the scene of a steady flow of direct transactions between producers and consumers. Here each producer accepts full responsibility for advertising his produce, finding customers and obtaining information to guide him in bargaining over the price.

In larger markets and where producer and customer are separated by distance, time and processing requirements, purchasing and selling services may be furnished in conjunction with other services such as transport, storage and processing or by specialists, commission agents, brokers and auctioneers who may neither handle nor take possession of the goods sold provide a professional service in the negotiation of sales in intern for a fee.

Financing:

Goods cannot pass through the marketing system without financial support. The owner of goods at any stage must either sacrifice the opportunity to use his own capital elsewhere or he must borrow the necessary from other source. The fish farmer needs capital for the phase during which he is in possession of his produce and awaiting sale

and payment. Wholesalers must finance their stock and also fixed marketing facilities such as processing and storage plants transport equipment and display premises.

Retailers must also finance their sales premises, that part of their stock which wholesalers will not carry; and in some case retail customer's purchases. All these financing needs to involve interest charges, which may be very high in countries where capital is scarce, and risks are great.

Risk bearing:

The carrying of risks is distinct from the provision of financing services. There are important marketing risks, which financing agencies will not accept and these remain the responsibility of the individual trader. The burden of these risks also contributes to the cost of marketing and must be covered by an equivalent expectation of profit. One of the major risks in marketing is that of a fall in price. If the general price level for a commodity should fall by 20 percent for example, while the commodity is in the ownership of either producer or market handler, he would have to accept this as a loss. Such variations are greater in case of fish products, which are perishable.

Marketing agencies:

Marketing agencies carry out marketing functions or offer marketing services. There are two main routes through which fish commodities reach the consumers.

Direct route:- some times fish commodities generally move from producers to consumers. There is a complete absence of middleman or intermediaries.

Indirect route:

Fish commodities generally move from producers to consumers through intermediaries or middleman. The number of intermediaries may vary from one to many.

Marketing agencies may be individuals acting independently, partnerships, large firms or branches thereof co-operatives or governmental corporations. Any of these various types of economic unit may also act in several capacities at the same time.

Country buyers:

Country buyers under take the initial work of assembling produce from farms or local country markets. They may be farmers who collect the produce of other farmers, agents of processing plants, co-operative organisations and government procurement agencies. He may act either on commission or purchase on his own account.

Wholesale distributor:

They may be defined as market intermediaries who sell to retailers and other merchants but not in significant amounts to ultimate consumers unless the latter are industrial users. They under take the transport, storage and preparation for consumption of commodities. They handle and play one of the major parts in marketing. Some wholesalers are criticised as "speculators" who hamper the flow of goods through the market. a speculative buyer is one who is willing to accept greater risks than any others. By when and where demand is slack and attempting to resell when and where demand is relatively high, he is stabilising the market moving through time and space to the advantage of society and preventing the price level from fluctuating between still wider extremes.

Packers and processors:

Packers and processors change the farm of the products they handle to one more convenient for marketing and more acceptable to the consumer. They provide the plant and equipment, the technical knowledge, experience and capital necessary to carry out the transformation of the product.

Processors generally derive their income from the difference between their buying and selling prices on outright purchases, plus the proceeds from the sale of by-products. They may pack or process for farmers, wholesalers or large retailers in return for a fee at a fixed rate on the volume handled.

Commission agents:

Producers and wholesalers frequently wish to display of their produce in markets, which they cannot conveniently attend personally. Commission agents specialize in buying and selling for absent principals and take charge of goods on their behalf. Generally they have considerable discretion in the making of decisions and are encouraged to do well for their client by remuneration in the form of percentage of the price obtained. The commission agent runs no risk, but he must do at least as well for his client as others would if he is to maintain a steady flow of business.

Brokers:

Brokers bring potential buyers and sellers together. Theirs is an extremely specialized job, involving an ultimate knowledge of supplies, requirements and prices in various markets. The term broker is best restricted to agents who do not own or handle goods.

The actual transaction takes place between the original buyer and seller with the broker as counsellor or intermediary in return for a fee. Brokers widen the market beyond that otherwise accessible to a less specialized buyer and seller, because they are in touch with more dealers of the appropriate type and can keep themselves better supplied with up to date information.

Auctioneers:

An Auctioneer also offers a special service in the negotiation of purchase and sales. He concentrate buyers and sellers together at a particular time and place, negotiates sales quickly, yet in such a way that all present informed of the bids and disposes of all the produce offered. He may furnish a place for public display and sale and usually ensures prompt payment for all purchases.

Retailers:

The function of Retailers is to set up establishments, procure supplies and display them in forms and at times convenient for consumer customers. Usually the retailer buys from a few wholesale distributors or processors in relatively large lots and breaks the goods down to small lots suitable for purchase by numerous small buyers on a day-to-day basis.

Specialization and integration: -

In the simplest markets the farmer carries out all the marketing functions himself. He prepares and packs his produce, transports it to consumer's home or to a nearby marketing place, informs himself on values, displays his produce and haggles over the price until the product is sold. If it cannot be sold on one day, then he stores it until the next, acting meanwhile as his own financing agent and risk bearer.

The services of marketing agencies outlined above a considerable simplification of the degree to which these various parts of the marketing process have been separated and developed as specialized business. In this way a service can be offered at a lower cost, relative to the results achieved, than that at which it could be undertaken by producers or consumers themselves. The techniques and size of modern business organization now seems however, to favour the recombination of these functions under a single management, a development known as the integration.

Two basic forms are distinguished. Horizontal integration occurs when a number of units performing the same activities in different places are brought under a single management. The retail grocery chain or the wholesale firms with branches operating in

many different markets simultaneously are examples of horizontal integration. Vertical integration occurs when units carrying out successive marketing are linked together under a single management. A retail firm which sets up its own wholesale purchasing organization extending back toward the source of supply and acquires its own processing facilities is vertically integrated as is also a processing plant with its own country buyers and wholesale distribution department.

Horizontal integration enhances bargaining power in buying from suppliers and makes advertising more profitable because of the larger turnover handled at a particular level. Vertical integration gives control over supply sources and/or sales outlets at each marketing stage and eliminates some selling and purchasing costs. Both forms of integration, however, demand administrative capacity adequate to match the complexity of the organization. Vertical integration further requires that the operations of the successive parts are closely dovetailed together for exclusive interlink age can impede as well as assist the efficient operation of each successive unit.

Middlemen:

Middlemen are those individual or business concerns, which specialize in performing the various marketing functions and rendering such services as are involved in the marketing of goods. They do this at different stages in the marketing process.

- **Merchant Middleman:**

Merchant Middlemen are those individual who take title to the goods they handle. They buy and sell on their own and gain or loss depending on difference in the sale and purchase prices. Merchant Middlemen are of two types.

- Wholesalers
- Retailers

- **Agent middleman:**

They act as a representative of their clients. They do not take title to the produce and there fore do not own it. They merely negotiate the purchase and or sale

E.g.: -commission agents or arhatias

Brokers

- **Speculative middleman:**

Those Middlemen who take title to the product with a view to making a profit on it are called speculative middleman. They are not regular buyers and sellers. They specialize in risk taking. They buy at low prices and sell in the off-season when price is high. They make a profit from short run as well as long run price fluctuations.

Facilitative middleman:

Some middlemen do not buy and sell directly but assist in the marketing process. Marketing can takes place even if they are not active but the efficiency of the system increases when they engage in business. The middleman receives their income in the form of fees from those who use their services. The important facilitative middlemen are

Hamals or labourers

Weighman

Graders

Transport agency

Communication agency

Marketing institutions:

Marketing institutions are big business organizations, which have come upto operate the marketing machinery. In addition to individuals, corporate, co-operative and government institutions are operating in the field of fish marketing. They perform one or more marketing functions. They assure the role of one or more marketing agencies described earlier. Some important institutions in fisheries sector are:

- MPEDA
- Fisheries cooperative societies

Marketing channels:

Marketing channels are routes through which fisheries commodities move from producers to consumers. The length of the marketing channel varies from commodity to commodity depending upon the quantity to be moved, the form of consumer demand and degree of regional specialization in production.

Definition:

Marketing channels may be defined in different ways. According Moore et.al. The chain of intermediaries from whom the various food grains pass from producers to consumers constitutes their marketing channel.

Kohls and Uhl have defined Marketing channel as alternative routes of product flows from producer to consumers.

Factors affecting length of marketing channels:-

Marketing channels for fisheries products vary from product to product, country to country, lot to lot and time to time. For example marketing channels for fish may be different from shrimp. The level of the development of a society or country determines the final form in which consumers demand the product. For example, consumers in developed countries demand more processed foods in a packed form. In countries like India, fish are purchased in the raw form and processing is done at consumer surplus. Again the lots originating at small farms follow different route or channels from the one originating in large farms. For example, small farms usually sell their produce to village traders; it may or may not enter the main market. But large farms usually sell their produce in the main market, where it goes to the hands of wholesalers. The produce sold immediately after harvest usually follows longer channel than the one sold in later in months. With the expansion in transport and communication network, changes in demand and the development of markets, marketing channels for fish products in India have undergone a considerable change, both in terms of quality and length.

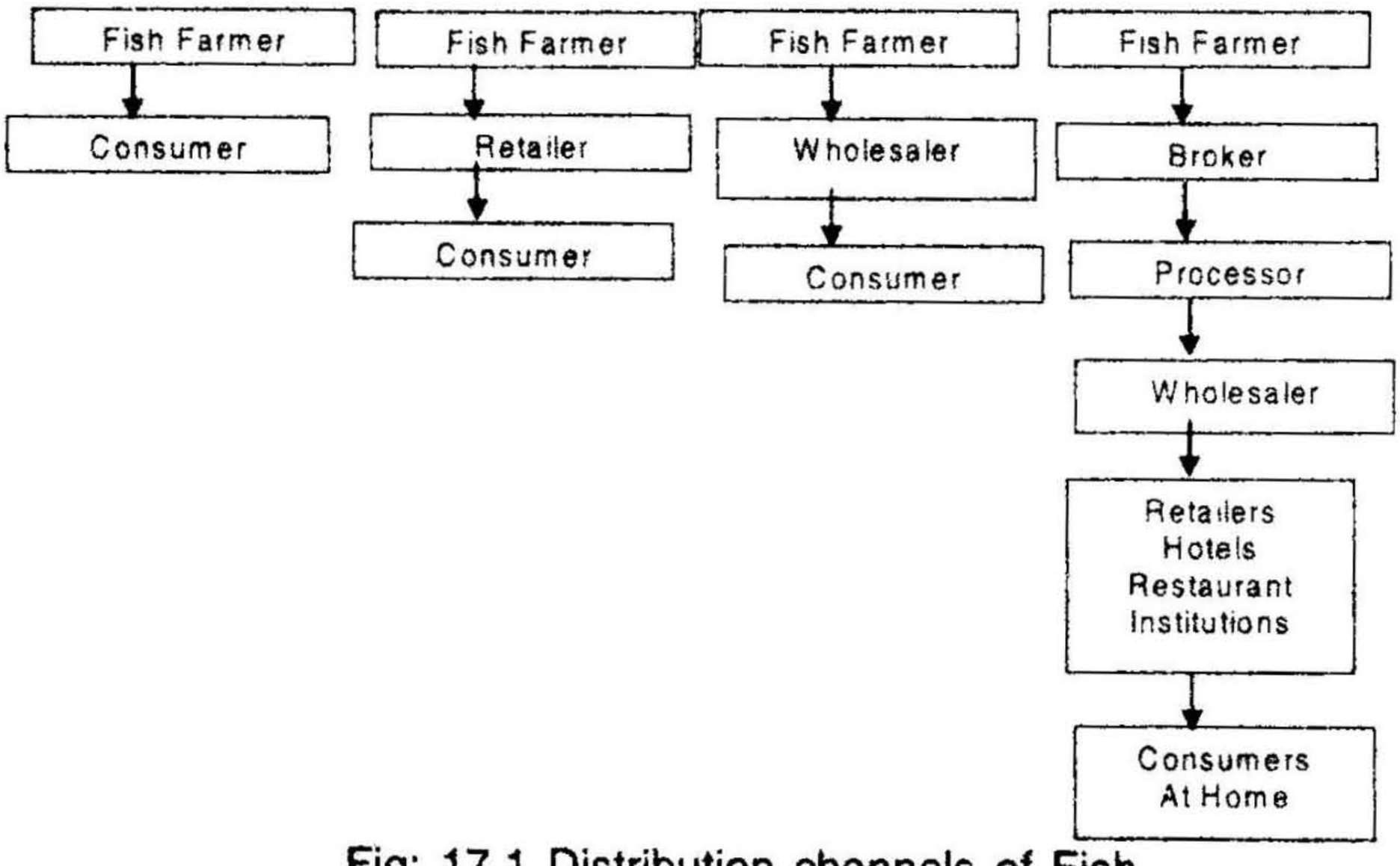


Fig: 17.1 Distribution channels of Fish

Market information:

Market information is an important marketing function, which ensures the smooth and efficient operation of the marketing system. Accurate, adequate, and timely availability of market information facilitates decision about when and where to market products. Market information creates a competitive market price and checks the growth of monopoly or profiteering by individuals. It is the lifeblood of a market.

Meaning:

Market information may be broadly defined as a communication or reception of knowledge or intelligence. It includes all the facts, estimates, opinions, and other information, which affect the marketing of goods and services.

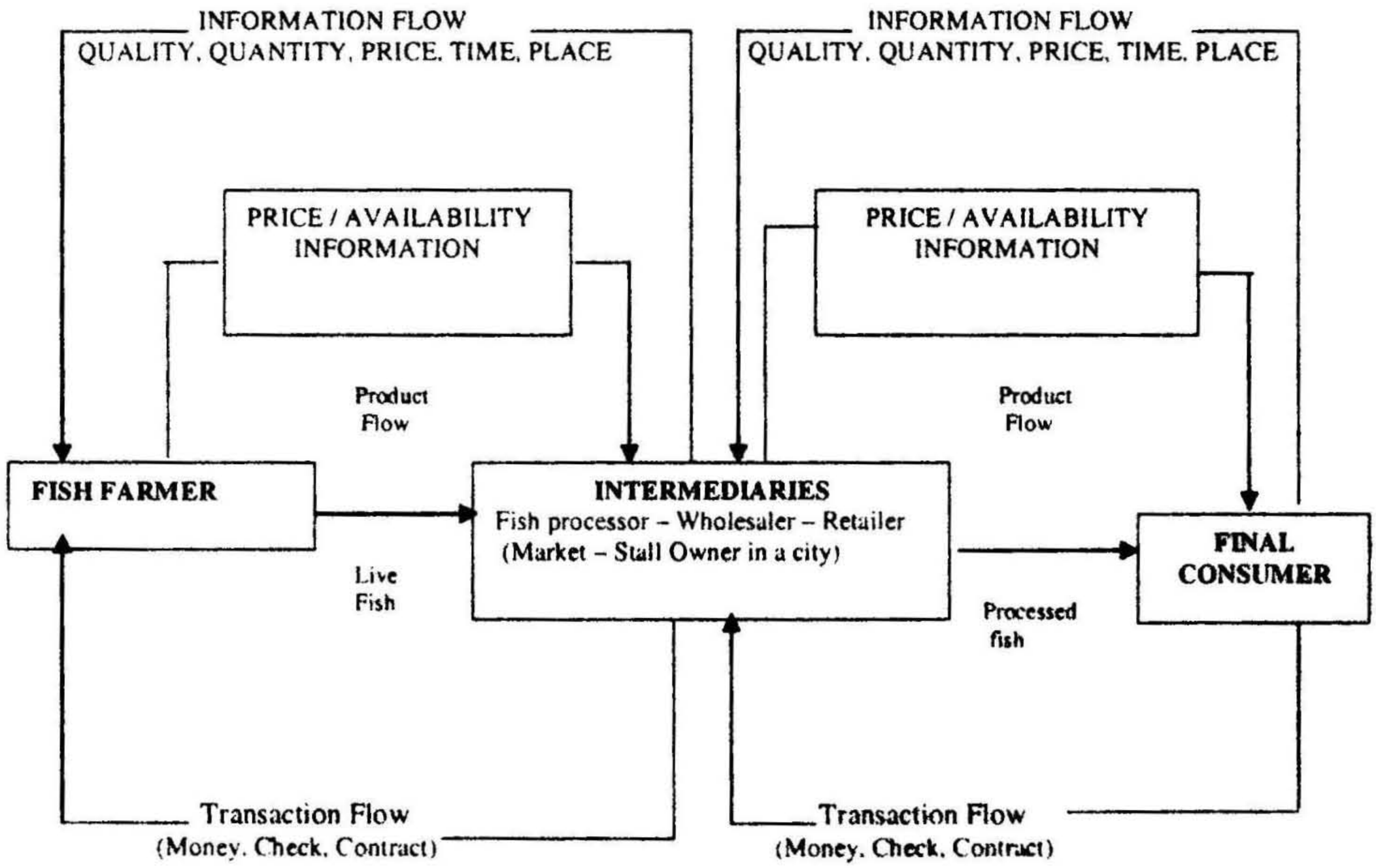


Fig 17.2 Market Information flows

Importance:

Market information is useful for all sections of society, which are concerned with marketing. Its importance may be judged from the point of view of individual groups. These groups are.

Farmer-producer:

Market information helps in improving the decision making power of the farmer.

A farmer is required to decide to when, where, and through whom he should sell his produce and buy his inputs. Price information helps him to take these decisions.

- **Market middleman:**

Market middleman need market information to plan the purchase, storage, and sale of goods. On the basis of this information they are able to know the pulse of the market (i.e. whether the market is active or sluggish), the temperature of the market (whether prices are falling or rising), and market pressure (whether the supply is adequate, scarce, or abundant).

- **General economy:**

Market information is also beneficial for the economy as a whole. In a developed economy, there is need for a competitive market process for a commodity, which regulates the prices of the product. The competitive process contributes to the operational efficiency of the industry, however, a perfectly competitive system is difficult to obtain but the availability of market information leads towards the competitive situation. In the absence of this system, different prices will prevail, leading to the profiteering by specialised agencies. The business of forward trading is based on the availability of market information.

- **Government:**

Market information is essential for the government in framing its agricultural policy in the regulation of markets, buffer stocking, import- export, and prices.

Types of market information:

Market information is of two types:

- Market intelligence: this includes information relating to such facts as the prices that prevailed in the past and market arrivals over time. These are essentially a record of what has happened in the past. Market intelligence is therefore, of historical nature. An analysis of the past helps us to take decision about the future.

- Market news: - this term refers to current information about prices, arrivals and changes in the market conditions.

Criteria for good market information:

- Market information must be complete and comprehensive

- The accuracy of market information is essential. The collection of accurate market information is a tedious and expensive task under changing market situations.

- Market information must be relevant in the sense that it must be collected, arranged

and disseminated, keeping in view of the user's interest.

- There must be sense of confidentiality among the firms whom the information has been collected.
- Trustworthiness is another criteria of good market information.
- Every person engaged in marketing must have equal access to the available information.
- Market information must be made available in time.

Criticisms of market information:

The market information is criticised by the users on the following grounds.

- They cannot calculate market information provided to the cultivators because of their illiteracy and poor communication.
- Market reports are incomplete in many respects, often there is no mention of quality when the price is quoted and the prices quoted is other than a modal price. In many cases, the reported price varies considerably from the actual because of inaccurate field reporting, sampling errors and other factors.
- There is manipulation in the collection of information for market reports specially if the collector is biased and has pre-conceived notions.
- Most of the time the news reported is so late that it is of no use. There is great time lag in the publication of the magazines and reports pertain to wholesale marketing. Very little information on retailing is available.
- The market information that is made available is of greater use to the buyers of farm products than to the farmers selling their products.

Market intelligence in India:

Market intelligence is an essential function for the formulation of sound price policy and its successful implementation. The formulation of a sound price policy requires an analysis of long-term trends in the data on prices, arrivals, demand, supply and other information. A market intelligence provides the necessary data for such an analysis and for an understanding of the behaviour of relevant factors and helps in the evolution of a price policy.

CHAPTER XVIII

GOVERNMENT AND CO-OPERATIVE IN MARKETING

Government in Marketing

Government of India plays a very important role in marketing. It holds different regulatory programmes, facilitating programmes in marketing and also looks after the export marketing.

Government Regulatory Programmes

The regulatory programmes involve the exercise of the police power of government to safeguard the welfare of industries with which the regulations are concerned, and to protect the health and the interest to consume the products of these industries.

Government regulatory programmes include:

1. Consumer Protection

It is a valued public service to protect consumers against defects in retailed products, which the consumers would have difficulty in detecting. Some legislations are there to protect the consumers against fraudulent. The legislations cover diseases in livestock, soundness, wholesomeness and cleanliness of all kinds of fisheries products, handling, marketing and grading, stages of processing, storage, distribution, health of workers engaged in industries, inspection of standards, tests for presence of food additives and misleading advertisements.

2. Product Policy

Large-scale investment to bring out a new product or substantially expand the existing production requires an industrial license under the Industries (Development And Regulation) Act, 1951. As per the Act, a license becomes necessary in the cases of:

a) Establishing a new undertaking,

b) Taking up the manufacture of a new article, and

c) Substantially expanding the capacity in an existing line of manufacture.

In the case of small-scale industries (defined as undertakings with not more than Rs. 10 lakhs investment in plant and machinery) a registration is to be obtained from the Director of Industries at the State level. Though this procedure is much simpler, some State Directors consider the scope of the proposed industry before granting registration.

3. Control over Price and Distribution

The justification behind price and distribution control lays the Government's policies of planned economic development. Price controls are necessary for industrial planning. A certain amount of control is beneficial to the modern industrial sector. But this control, naturally enough, is so exercised that prices are kept low enough to provide earnings to financial growth and keep the shareholders content. This stability of price enables the mature corporations to pursue goals other than profit maximization.

A low price fixed for a raw material or intermediate product may provide an advantage to the producers. But, this advantage is rarely passed onto the ultimate consumer. This will be unavoidable where prices are controlled at the input stage and left free at the consumers market

To protect the interests of consumer the Government may fix a price, which will naturally be below the free market price. As immediate consequences, the control will bring down the price from its free market level. This lowering of price will increase the demand. On the supply side the controlled price may reduce the profit margin and act on the producers as a disincentive to further investments. Sometimes the impact of price control may also be favorable. The controlled price, which leaves only a small profit margin may compel the producers to enhance production and sales (which is on the increase now) and thereby increase their total profits in turnover.

An ineffective control over prices and/or distribution inevitably leads to black market. While the large and well-established units of the organized sector are compelled (since they may be under closer watch by the Government) to sell at the controlled prices, many small and new firms flourish by making quick money through black market. It is said that price control is "the father of black markets" and carries with it an insidious threat to public morality.

Price controls existed in India even before Independence. They were mainly intended to protect certain industries and to give them an imperial preference. The Tariff Board was first constituted in 1923 to investigate the claims of particular industries for protection. Further, the Government has at times entrusted the price fixing task to special Committees constituted for the specific purpose. The Agricultural Prices Commission was set up in January 1965 to advise the Government on price policies for agricultural commodities. The Government in 1971 to conduct inquiries about industrial products and recommend prices also established a separate Bureau of Industrial Costs.

4. Uniform Weights and Measures:

Another essential regulatory step is the establishment of a uniform system of weights and measures, preferably the metric system. because of its simplicity. Where a complete changeover from another system is involved, it should be carried out in phases.

Authorities concerned in regularizing weighing and measuring procedures must also accept responsibility for seeing that the necessary equipment is available to traders at a price they can afford to pay. It should be exempted from duties. etc. in low-income countries. The purchase of approved weighing and measuring equipment can be aided possible by the provision of cheap credit or other financial assistance.

5. Minimum Standards:

Definition of minimum standards for basic commodities may follow, in the case of some animal products it may help to protect public health, but the main purpose is to facilitate marketing on a standardized basis. Minimum standards of quality, condition or size may be promulgated for important traded items. Types and specifications of authorized packages may also be set out by law to facilitate safe handling and speedy recognition.

Commodity definition and regulation of packages should always proceed in collaboration with the trade. Marketing practices should be studied carefully and no law should be promulgated until business and government experiences indicate that enforcement will not be difficult. Advisory committees representing the different government departments and trade groups concerned best supervise this work.

The development of suitable and effective regulatory systems requires considerable time. Duplication of methods developed in other areas or industries may be costly and futile. The laws and procedures of other areas are best regarded only as sources of ideas. Usually it is good policy to begin with regulation of commodities exported to countries with high consumer standards or transported over distances.

The detailed regulation of products commonly sold near the firm is more difficult, and may not be worthwhile unless there is some special justification. It should certainly not be undertaken merely for administrative uniformity.

6. Consumer's Right to be Informed:

The marketing oriented company recognizes that the consumer has the right to be informed, the right to choose, the right to expect reasonable quality as well as the right to be heard. In other words, the consumer must be made known about some basic facts like price, nature of contents etc.

Secondly, he must be encouraged to use his discretion by choosing the most advantageous commodity. Choosing is made easier when there are comparable yardsticks available.Thirdly, the consumer expects that the quality of the product will not be injurious (without his knowledge), will be safer, and provide a reasonable satisfaction. Finally, the consumer expects that his grievances should be hard. The Packaged Commodities (Regulation) Order of 1975 is an attempt to fulfill the rights of the consumers with the legal force. Some important provisions of the order are considered below:

Particulars to be indicated on every package:

(i) No person shall repack for retail sale, or cause to be repacked for retail sale any commodity unless each retail package in which such commodity is repacked bears a label security affixed there, a declaration as to:

(a) The identity of the commodity in the package

(b) The quantity in terms of standard unit of weight or measure of the commodity in the package

(c) The month and the year in which the commodity is repacked, and

(d) The price of the package.

(ii) Where a package in which a commodity repacked is opened and the commodity therein is sold to one or more persons, the price to be charged from the purchaser shall bear the same proportion to price of the package as the quantity sold to the purchaser bears to the total quantity contained in the package.

(iii) Where indication on a package of its net contents and the price is either impossible or impracticable by reason of the size or nature of such package a label, stamp, sign or tag indicating the net contents and the price shall be attached to each such package.

(iv) The declaration on a package, as to the quantity contained in the package shall be exclusive of wrappers and materials other than the commodity contained in the package.

(v) Where a package is provided with an outside container or wrapper or wrapper container shall also contain all the information which are required to bear on the package except where such container or wrapper itself is transparent and informations on the package itself are easily readable through such outside wrapper or container.

(vi) The statement on a package or label as to the net weight, measure or number of the contents thereof shall not include an expression which tends to qualify such weight, measure or number.

(vii) Name and address of the packer is to be indicated on each package. No seller sells unless such packages with the requiremehts referred to above.

7. **Register of Trade Marks:** A record called register of Trade Marks is kept at the Head Office of the Trade Marks Registry containing all registered trade marks with the names, addresses and description of the proprietors, and such other matters as may be prescribed.

Government Facilitating Programmes:

In this section attention will be drawn to ways in which governments can foster marketing improvements by making resources and services available to the marketing system and its users.

1. Investment and Credit:

Construction of various facilities like market set up or buildings, railways, roads, harbours, bridges, processing facilities for fisheries products, cold storage etc for improved marketing require long-term investment capital. Government generally makes the investments. Government can also do much to facilitate the introduction of improved methods of handling, processing and distributing farm and fishery products. Credits and relief from import restrictions or tax burdens may encourage investment in new equipment. Government is now making credit available on especially favourable terms. They are also subsidizing the cost of administration, both by maintaining government credit organization and assisting co-operatives set up to manage the distribution of credit at the village level.

2. Bonded Warehousing:

The bonded warehousing system, which has provided its value as a marketing and credit facility, depends on government sponsorship and supervision. The operator is required to take up bond to ensure users against fraud and theft. The warehouse operator has sole custody of commodities stored with him, and issues to the depositor a certificate of storage defining the commodity exactly. The products are then placed under government seal and can be removed by only upon surrender of the warehouse receipts. Such receipts are then acceptable as a basis for credit since the warehouseman will only release the goods in store to holders of the warehouse receipts. Though seemingly complicated, such transactions can be handled conveniently with little delay.

3. Market Information and News Services:

Another field in which government can facilitate market operations and help the system function more efficiently is in the provision of information regarding stocks, impending supplies, movements, consumptions and prices. Public provision of widely needed data is efficient because it narrows the range over which farmers, traders and consumers must find information themselves which will be very much beneficial for them for their own aspects.

4. Investigations and Research:

Research in the field of marketing divides into two distinct categories. The term 'market research' is used to denote enquiries into possibilities of opening up of new markets, or expanding ones through better knowledge of consumer tastes and spending habits. 'Marketing research', in contrast, has a broader and more profound significance. It means research into the efficiency of the marketing system as a whole, of the methods

employed within it and of the organizations using them. It is generally directed towards the objective of improving the marketing services available to their users, i.e., producers and consumers. Data and conclusions presented as a result of such research may be helpful to individual marketing agencies and by raising their efficiency, raise that of marketing system as a whole. Market research is also required to develop sales. Thus, it is essential that government desires of promoting marketing improvements allocate adequate funds for research.

5. Marketing Education and Extension Programmes:

In the line with government responsibility for general public education it is the duty of providing educational facilities in marketing, both on a specialized level and on one adapted to the practical needs of farmers and traders. Policy makers, administrators, teachers and the directing personnel of the major business enterprises, co-operatives and credit institutions concerned in the marketing of farm products would be better equipped to handle their responsibilities if they had a thorough training in agricultural marketing principles and practices. At the same time extension programmes of improved methods of packing, storage, transport and distribution must be explained to farmers to traders in ways they understand. The Indian Directorate of Marketing and Inspection at Sanghi provides specialized training for market secretaries.

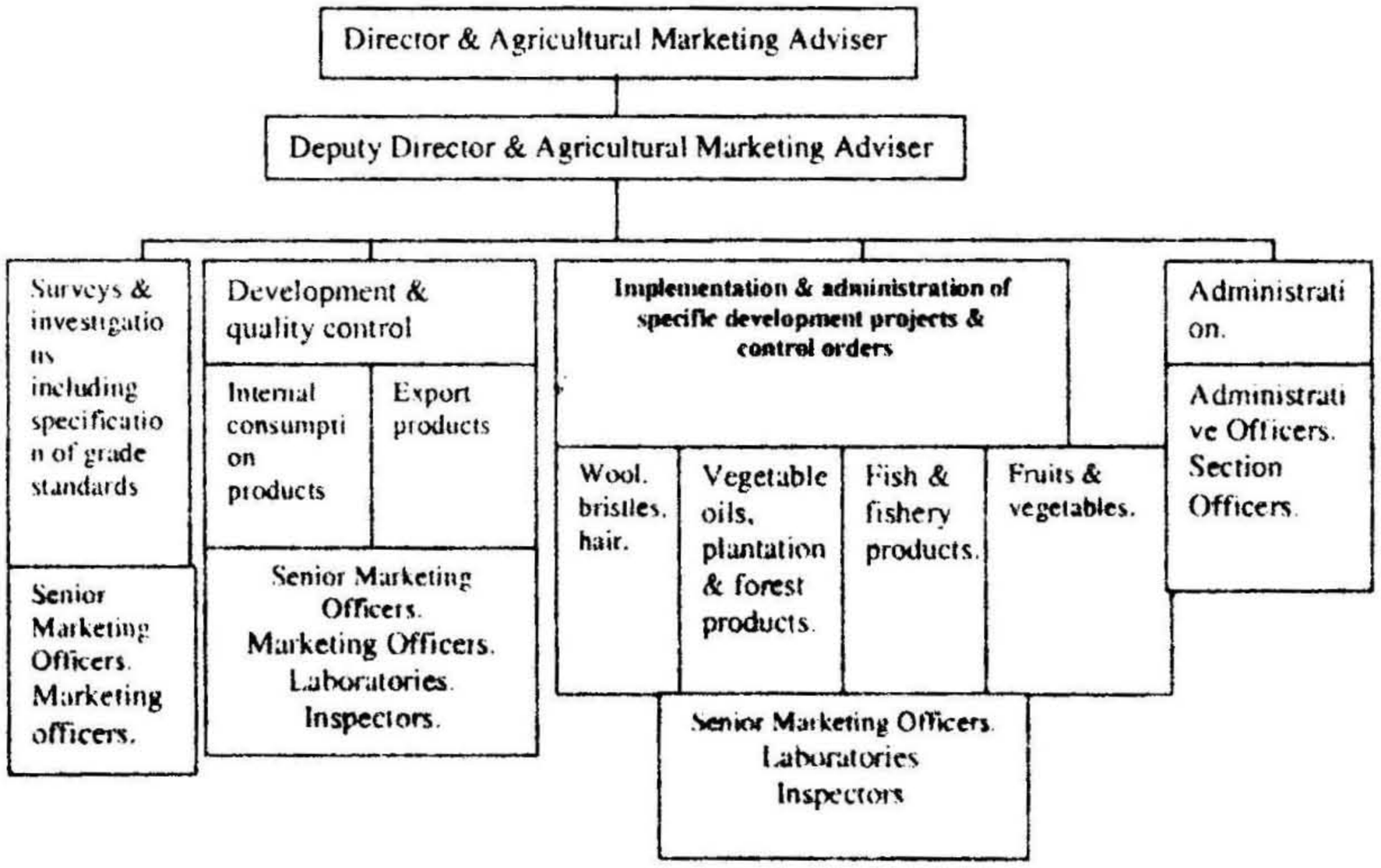


Fig.18.1. Organization of the Indian Marketing Department.

Government in Export Marketing:

In the field of export marketing, government's role is characterized mostly by the provision of certain incentives and some institutional arrangements.

Institutional Arrangements:

One of the policy decisions of the Government is to have public sector agencies that will be encouraged to play an expanding role in developing exports and building up the export capabilities of manufacturers and exporters.

Another important decision of the Government, which has given the public sector commanding position in the export/import trade, is the " Canalization of imports/exports ". This means that a list of specified products can be exported or imported only through the specified public sector agencies. Canalization is a major institutional change introduced with the establishment of " The State Trading Corporation " (S.T.C.) in 1956 and this organization and the work entrusted to it have grown to such a large extent that another corporation " Minerals and Metals Trading Corporation " came into existence in 1963. In course of time many more such institutions, statutory came into existence.

The objectives of canalization of imports/exports are:

- To prevent unhealthy competition among Indian exporters;
- To plan long-term export strategy;
- To prevent under invoicing competitions,
- To obtain better bargaining power where exporters are few;
- To obtain bulk shipping space at economic rates.

Table: 18.1. Institution Canalizing Fish & Fishery Products

Name of Canalizing Agency	Year of Incorporation	Item Canalized	Canalization Begun on
State Trading Corporation (S.T.C.)	1956	Dried Fish, Prawns, Shark fins etc.	01.01.1967

Some Important Institutions Involved in Export Marketing:

1) **State Trading Corporation of India (S.T.C.):** It was set up in 1956 as an autonomous corporation to play an important role in implementing the Government's foreign trade policy. The main functions of the S.T.C. are:

i. Diversification and consequently increase in India's Export trade;

ii. Exploring of new markets for existing as well as new products;

iii. Promotion of long-term export operations and 'difficult to sell' items.

For effective marketing, the S.T.C. has opened branch offices in many countries and has associates in other parts of the world.

2) **Export Promotion Councils:** A number of export promotion councils have been established mainly with a view to assisting in the promotion of exports of specific commodities or group of products. The Marine Products Export Promotion Council is one of these councils.

3) **The Board of Trade:** The Board was constituted in 1962. It consists of senior officials of the Economic Ministers of the Government of India, leading representatives of organized trade and industry and economists of repute.

The Board concentrates on such areas as: (a) expansion of export oriented production and increase of exportable surplus and (b) the improvement of the infrastructure required for substantial exports.

4) **Indian Institute of Foreign Trade:** It was set up in 1963, as an autonomous body registered under the Registration Act. The main functions of it are:

i. Training of personnel in export trade;

ii. Research Projects in furtherance of exports; and

iii. Collection of documents and data on all aspects of export trade.

5) **Export Inspection Council:** This council came into being mainly to ensure that quality standards of export products are maintained as essential in the export trade. The Export (Quality Control and Inspection) Act came into being in 1964. Under this act, the Government of India notifies products that will be subject to compulsory quality control or inspection or both before shipment.

Under the act of 1964, the Government of India set up the Export Inspection Council. It has set up five Exports Inspection Agencies (E.I.A.), one each at Delhi, Mumbai, Kolkata, Chennai and Cochi.

6) Directorate of Exhibitions and Commercial Publicity: In the Ministry of Commerce, there is a separate Directorate of Exhibitions and Commercial Publicity. Its main functions are:

i. Organizing India's participation in industrial trade and exhibitions;

ii. Organizing exclusive Indian Exhibitions abroad;

iii. Publications.

The publications of the Directorate are:

a) Economic & Commercial News - a weekly,

b) The Journal of Industry and Trade - a monthly,

c) Indian Export Service Bulletin - a weekly publication.

Other important institutions involved in export marketing are:

7) The Minerals & Metals Trading Corporation (Est. -1963)

8) Commodity Boards (eight different commodity boards)

9) Advisory Council of Trade (Est. - 1st January 1970)

10) Indian Council of Arbitration (Est. -1965)

Export Finance:

Finance would be essentially needed after one obtains an export order during processing or manufacturing the products, transportation, shipment, post-shipment, storage etc. The Government assists in finance by different schemes like short-term financing, post-shipment finance, medium and long-term finance through different commercial banks. There are certain conditions applied in different schemes and loans like interests, subsidies etc. In India, Industrial Development Bank of India (I.D.B.I.) plays a vital role in financing of export.

Co-operatives in Marketing

Co-operative fish marketing is a form of co-operation, which aims at maximizing the price paid to the member fishermen for their catches.

Advantages of Co-Operative Marketing:

1) Co-operation by producers or consumers to provide needed marketing services is an approach to marketing improvement.

2) In joining together to undertake marketing function, such as assembling, packing, storing and selling, producers and consumers are setting up an alternative marketing agency to those already available and thus raising the level of competition.

3) The formation of a co-operative could improve marketing significantly whether it could expect to operate more efficiently than existing enterprises possibly by obtaining special advantages through the co-operation of producers and consumers.

4) A co-operative should be able to reduce marketing costs by the economical use of large-scale equipments and better methods of processing and marketing.

5) It should be able to obtain higher sales prices by modifying the form of the produce sold and dividing it into more affective categories, by controlling the volume sold in accordance with changes in demand

6) It is also able to increase the bargaining powers of producers and recapture for them the part of the value of the product that was being diverted into monopolistic profits.

7) A critical business feature of a co-operative is that certain sales decisions are made jointly. In this way the co-operative limits the competition between its own members.

8) By bargaining for all of them, a co-operative can exert more control over the price of their produce and can thus offset monopolistic power in the hands of buyers, and obtain advantages not attainable if individual members sell independently.

9) Co-operative marketing provides new competition in a situation where exists traders' charge to high price for their services.

Conditions favoring successful co-operative marketing:

1) Specialized producing areas distant from their major markets.

2) Concentration and specialization of production.

3) Similarities of product and of production methods.

4) Population characteristics.

5) Areas, in which there are independent, unrelated changes in annual output and demand.

6) Groups, which are dependent on one or a few crops for their total income.

Reasons for setting up a co-operative fish marketing:

1) Fishermen who used to produce more fish and earn more of getting their crops to the market and selling it at profit.

2) Fishermen, who are already in business, were selling their catches to intermediaries who exploited them by giving false weight, paying low prices or advancing money at high rate of interest at all levels of the market system.

3) Inadequate infrastructure facilities such as absence of refrigerated fish pants, cold storage and processing facilities. Fishing operation being essentially seasonal in nature and the catch being extremely perishable, the periodic surplus (gluts) in the market contributes not only to lowering the prices but also facing inadequate infrastructure facilities.

4) Inability of the small-scale fishermen to stabilize price, income, the fishermen were obliged to sell their catches at a lower price.

5) Small-scale fishermen could not sell their catch according to grades.

Roles of co-operative fish marketing

1) To secure the best possible market price for the members of the co operative so as to improve their standard of living

2) Reducing marketing costs by providing them with low service charges for storage, transport, processing, commission etc. that could enable the fisherman to get return for their catch.

3) Replacing the middlemen and performing their function economically and efficiently.

4) Avoiding competition amongst the members by pulling their bargaining power and thus exercising better control over the price of their catch.

5) Jointly with the credit co-operatives association, helping the fishermen to maximize their catch and increasing the revenue from the catch.

6) Helping to make arrangements for loans from the credit operatives and acting as agents for recovery of the loans advanced by the co-operative credit society.

7) Helping to sell products (catches) at a price, which is remunerative to the fishermen and is within the consumer's ability to pay unlike the ineffective market, which harms both the fishermen and the consumers.

8) Acting as a stabilizing force when there is a fluctuation in seasonal catch and demand.This is done by absorbing the stock arising out of fluctuations through control over storage and sales between seasons .It can also be processed into value added products, canned, smoked or dried fish, etc. so as to modify and increase its returns.

9) Helping to pull the catches and grade it by species, size and quality wise that could be sold to manufacturers and retailers at higher prices. This is much profitable than selling small lots, each including produce of different qualities to wholesalers who will themselves grade, pull and take the profit.

10) Helping to forecast the demand pattern in the coming 3, 6 or 12 months and decide accordingly whether to sell fresh or to process it, and if to be processed into what products. This helps to maximize the returns from the catch.

Marketing Acts:

The following Acts were enacted by the government and are in force. Their purpose is to improve agricultural marketing in the country

Grading of Commodities:

(a) For Agricultural Commodities:

The Agricultural Produce (Grading and Marketing) Act, 1937:

The Act provides for grading and marketing of agricultural commodities. The Act authorizes the Central Government to frame rules relating to fixing of grade standards and the procedure to be adopted for grading the agricultural commodities. The Act of 1937 was amended in 1986. This amendment seeks to review the provisions of the Act, strengthen the same with a view to promoting and protecting the interests of the consumers and makes the penal provisions of the Act more deterrent and thus provides more teeth to the Act.

(b) For Manufactured Commodities:

The Indian Standards Institution (Certification Marks) Act, 1952:

Manufactured products are graded in accordance with the standards laid down by the Indian Standards Institution established under this Act and graded products bear the ISI label. The name of the Indian Standards Institution has been changed to Bureau of Indian Standards (B.I.S.) under the Bureau of Indian Standards Act, 1986. The status and scope of activities has been enlarged with greater thrust to consumer protections, improving the level of quality of Indian products and providing of larger network of testing and consultancy services.

Warehousing of Agricultural Commodities:

The first Act, The Agricultural Produce (Development and Warehousing Corporation) Act was passed in 1956. The Warehousing Corporation Act, 1962, replaced the earlier Act.

Weights and Measures:

(a) The Standards of Weights and Measures Act, 1958: This Act prescribes the compulsory use of metric system of weights and measures in the country.

(b) Standards of Weights and Measures (Packed Goods) Act, 1977: This Act prohibits the packing wrong goods in boxes and labeling of boxes. The Act also ensures packing of goods of the correct weights in the packages.

Regulation of Markets (Market Charges and Practices):

Acts for the regulation of markets were enacted in different states during 1960 to 1980.

Prevention of Food Adulteration:

The Prevention of Food Adulteration Act, 1954 and subsequent amendments

prohibits manufacture, storage and sale of adulterated and misbranded food items meant for human consumption.

Control of Forward Trading:

The Forward Market Control Act (Regulation), 1952 was enacted with a view to regulating forward contracts, prohibiting options in goods and dealing with certain other related matters.

Essential Commodities Act, 1955:

The important orders issued under this Act are:

(a) Control of Cold Storages: The Cold Storage Order, 1964 promulgated under Essential Commodities Act, 1955 has the objective of ensuring hygiene and proper refrigeration conditions in cold storage, regulating the growth of cold storage industry in a planned manner, rendering technical guidance for a scientific preservation of food stuffs in a cold and preventing exploitation of farmers by cold store owners. Cold Storage Order, 1980, replaced this order. This is more comprehensive than the earlier order of 1964. The Cold Storage Order of 1980 is applicable all over the country except in the states of U.P, West Bengal, Punjab and Haryana, which have promulgated their own State orders for regulating the cold storage industry.

(b) Meat Food Products: The Meat Food Products Order, 1973 issued under the Essential Commodities Act 1955, is in force since July 15, 1975. This order covers manufacture of meat food products in small factories as well as large factories under a licensing system that examines all aspects of hygiene. Under the provisions of this order, the meat factories have their own captive slaughterhouses.

Consumer Protection Acts:

The important Acts in this category are:

(a) Emblems and Names (Prevention of Improper) Act, 1950.

(b) Trade and Merchandise Marks Act, 1958.

(c) Monopolies and Restrictive Trade Practices Act, 1969.

(d) Prevention of Black Marketing and Maintenance of Supplies of Essential Commodities Act, 1980.

(e) Consumer's Protection Act, 1986.

Export of Commodities:

The Exports, Quality Control and Inspection Act, 1963: This Act controls the qualities of the products, which are exported to other countries.

Acts Related to Agricultural Inputs:

(a) Indian Seeds Act, 1966: This Act aims at regulating the quality of seeds sold for the purpose of agriculture and fisheries and envisages compulsory labeling and voluntary certification of seeds sold.

(b) Insecticides Act, 1968: This Act provides for compulsory registration of all insecticides, weedycides. The Act regulates import, manufacture, transport, storage, sales and use of all pesticides, weedycides and insecticides in the country.

Salient Features of Some Marketing Acts:

General Grading and Marketing Rules, 1937:

a. These rules may be called the General Grading and Marketing Rules, 1937.

b. Any person or body of persons desires of being authorized to mark any article with a grade-designated mark shall apply to the Agricultural Marketing Advisor to the Government of India, Faridabad.

c. If, after due enquiry, the Agricultural Marketing Adviser, or any person duly authorized by him in this behalf, is satisfied that it is expedient in the interest of better marketing that the authorization be granted, and that the applicant is a fit and proper person to receive a Certificate of Authorization, he shall issue such a certificate to the applicant. Each certificate shall state the name and address of the authorized person or body of persons, the articles to which grade designation marks will be applied, the period for which the certificate will be valid; and the premises at which the grade designation marks may be applied.

d. It shall be a condition of every certificate of authorization that during the operation of the certificate, the holder thereof shall, at all reasonable times, give access to the premises named therein to any person duly authorized by the Agricultural Marketing Adviser or by the Central Govt. and shall afford him facilities for ascertaining that marketing process is being correctly performed. The holder of the certificate shall keep a record of the number of packages marked with each grade designation mark. Any certificate of authorization may be cancelled, revoked, modified, or suspended by the Agricultural Central Govt., in that behalf, provided that 14 days' notice in writing has been given to the certificate holder at the address stated him to show cause why his certificate should not be cancelled, revolved, modified or suspended.

Cold Storage Order, 1964:

The Cold Storage Order, 1964 was passed by the Central Govt. in exercise of the powers conferred on it by section 3 of the essential commodities act, 1955 (act 10 to 1955) and came in force on 1st January 1965. The sallent features of the order are

a) No person shall carry on the business of storing of foodstuffs in a cold storage except under and in accordance with the terms and conditions of a valid license.

b) Every person, desiring to obtain a license, shall make an application duplicate to the licensing officer, together with the fees prescribed thereof and a copy of the blueprint of cold storage building plan.

c) In a granting or refusing a license, the Officer shall have regard to the following matters:

   i. The number of cold storage units operating in the locality where the cold storage, in which the food stuff are proposed to be stored, is located;

   ii. Refrigeration conditions of cold storage in which the food stuff are proposed to be stored; and

   iii. Any other matters which the licensing officer may consider necessary for the purpose

d) Cancellation of License: the Licensing Officer may after giving the holder of the license have an opportunity to show cause and after giving him three months' notice, cancel any license granted to him for any breach of the terms and conditions of the license, or for any contravention of the provisions of this order.

e) Every license shall, unless previously cancelled, expire on the 31st day of December.

The Cold Storage Order, 1980:

The cold storage order, 1980 was promulgated to replace the earlier order of 1964. This order is applicable all over the country; except in the states off Uttar Pradesh, West Bengal Punjab and Haryana, which have promulgated their own state, orders for this purpose. This order in addition to ensuring hygienic and proper refrigeration conditions in a cold store also has a provision of rendering technical guidance for a scientific preservation of foodstuffs in a cold store and preventing exploitation of farmers by cold store owners.

Prevention of Food Adulteration Act, 1954:

The Prevention of Food Adulteration Act, 1954 aims at achieving the objective of the consumers against the sale of adulterated or sub-standard articles in the market. The minimum quality standards have been laid down for the enlisted food items under this Act. Enforcement staffs have powers to draw the samples of food items from the manufacturer to relating outlet and get them tested by the Public Analyst. In case the sample is found to be sub-standard or adulterated, the lot is seized and prosecution is initiated against the party, which is liable to be punished upon conviction. This act has been powerful deterrent against the manufacture and sale of adulterated or sub-standard food products.

The Trade and Merchandise Marks Act, 1958:

The objective of the Trade and Merchandise Marks Act is to provide for the registration and protection of Trademarks and prevention of the use of fraudulent marks on merchandises.

A Trademark is one of the most valuable assets that a businessman may possess. The value of some trademarks is almost immeasurable. An ideal trademark should generally have the following qualities-

1. Easy to speak (pronounce).
2. Easy to remember.
3. Easy to spell.
4. Attractive appearance.
5. Speaks of desirable qualities of the merchandise.
6. Different from other trade marks in the same class.
7. Should be possible to affix it to the goods with which it is used.
8. Registrable and protectable (under law).

Market Integration:

Integration shows the relationship of the firms in a market .The extent of integration influences the market conduct of the firms and consequently their marketing efficiency. The behavior of a highly integrated market is different from that of a disintegrated market. Markets differ in the extent of integration and, therefore, there is a variation in their degree of efficiency.

Definitions :

According to Kohl and Uhl : " Market integration is a process which refers to the expansion of firms by consolidating additional marketing functions and activities under a single management."

Examples of marketing integration are the establishment of wholesaling facilities by food retailers and the setting up of another plant by a milk processor. In each case, there is a concentration of decision making in the hands of a single management.

Types of market integration: There are three basic kinds of market integration

a) **Horizontal integration**

This occurs when a firm or agency gains control of other firms or agencies performing

similar marketing functions at the same level in the marketing sequence. In this type of integration, some marketing agencies (say seller) combine to form a union with a view to reducing their effective number and the extent of actual competition in the market. In most markets, there is a large number of agencies which don't effectively compete with each other. This is indicative of some elements of horizontal integration. Horizontal integration is advantageous for the members who join the group. Similarly, if farmers join hands and form co-operatives, they are able to sell their produce in bulk and reduce their cost of marketing.

b) **Vertical Integration**

Vertical integration occurs when a firm performs more than one activity in the sequence of the marketing process. It is a linking together of two or more functions in the marketing process within a single firm or under a single ownership. For example, if a firm assumes the functions of commission agent as well as retailing, it is vertical integration

Vertical integration leads to some economics in the cost of marketing. A vertically integrated firm has an advantage over other firms in respect of greater market power either in terms of sources of supplies or distribution network. Vertical integration reduces the number of middlemen in the marketing channel. It is thus helpful for both producers and consumers.

Table: 18.2. Stages of a Vertically- Integrated Marketing System in Aquaculture

Supplies	Feed ingredients, Chemicals, Floating feeds, Sinking feeds, Antibiotics	Consumable and gadgets, oxygen meters, PH testing equipment	Equipment and farm building tractors, Feeders, Holding tanks.
Farming	Brood stock, Egg and fingerlings production Hatchery Nursery Growing		
Processing	Handling, Dressing, Packing, Freezing, Smoking, Canning, Salting, Storing		
Distribution	Brokerage, Promotion, Wholesaling, Retailing		

Vertical integration: It is of two types, forward or backward, depending upon the stages at which the integration occurs:

i. Forward integration: If a firm assumes another function of marketing which is close to the consumption function, it is a case of forward integration; for example, a wholesaler assuming the function of retailing.

ii. Backward integration: This involves ownership or a combination of sources of supply; for example, when a processing firm assumes the function of assembling/ purchasing the produce from villages.

Firms often expand both vertically and horizontally. The modern retail stores are a good example of this. Retailing firms have grown horizontally by expanding either retail stores or a number of commodities they deal in. They have grown vertically by operating their own wholesale, purchasing and processing establishment.

c) Conglomeration: A combination of agencies or activities not directly related to each other but are operated under a unified management, be termed a conglomeration. Example of conglomeration, IFB agro is involved in Fish and Shrimp processing as well as producing of home appliances.

Degree of Integration: There are two types of integration-

1) Ownership integration: This occurs when all the decisions and assets of a firm are completely assumed by another firm. The example of this type of integration is a processing firm, which buys a wholesaling firm.

2) Contract integration: This involves an agreement between two firms on certain decisions, while each firm retains its separate identity. When shrimp farms of an area jointly agree on the pricing of the shrimps and processed products, it is a case of contract integration.

Price Spread, Marketing Margins and Cost:

Price spread: In the marketing of agricultural commodities, the difference between the price paid by consumer and the price received by the producer for an equivalent quantity of farm produce is often known as farm retail spread or price spread. The price spread includes:

1) **Marketing cost:** The cost involved in moving the product from the point of production to the point of consumption, i.e., the cost of performing the various marketing functions and of operating various agencies.

2) **Marketing margin:** profit of the various market functionaries involved in moving the product from the initial point of production till it reaches the ultimate consumer. The absolute value of the marketing margins varies from channel to channel, market to market and time to time.

So, Price spread (PS) = Consumer's price (CP) - Producer's price (PP)

= Marketing cost (MC) + Marketing margin (MM)

Example :

A fish farmer with 100 kg of Rohu fish comes to a market. He takes these fishes to an auctioning yard where it is auctioned and sold to a wholesaler @ Rs. 30 per kg. The transportation cost of the farmer to bring the fishes from his farm is Rs. 0.50 per kg. The auction hall owner takes commission from the farmer @ Rs. 0.25 per kg. Then the wholesaler brings the fishes to another market with transportation cost @ Rs. 0.75 per kg and sold it to a retailer @ Rs. 35 per kg. The retailer sells the fishes to consumer @ Rs. 40 per kg in the same market. It is assumed that there is no loss in transit and no significant time lag.

Solution:

Transportation cost paid by the farmer =Rs. 0.5 x 100 = Rs. 50

\Total price of fish sold by the fish farmer =Rs.30 x 100 =Rs.3000

Commission taken by the auction hall owner = Rs. 0.25 x 100 = Rs. 25

Producer's price = Rs. {3000 - (50+25)} = Rs. 2925

Transportation cost paid by the wholesaler =Rs.0.75 x 100= Rs.75

Price of fish sold by the wholesaler to retailer =Rs. 35 x 100 = Rs. 3500

\Profit earned by the wholesaler = Rs. {3500 - (3000 + 75)} = Rs. 425

Total consumer's price = Rs. 40 x 100 = Rs. 4000

\Profit earned by the retailer = Rs. (4000 - 3500) = Rs. 500

\Price spread = Rs. [40 - {30 - (0.50 + 0.25)}] x 100

= Rs. (40 - 29.25) x 100

= Rs. 1075

Total marketing cost = Rs. (50+ 75) =Rs 125

Total Marketing margin =Rs. (25 + 425 + 500) = Rs. 950

Importance of study of marketing margins and costs: Studies on marketing margins and costs are important, for they reveal many facets of marketing and the price structure, as well as the efficiency of the system.

1) The magnitude of the marketing margin indicates the efficiency of the marketing system. It refers to the efficiency of the intermediaries between the producer and the consumer in respect of the services rendered and the remuneration received

by them. While comparing the efficiency to the marketing system by means of marketing margins over space or time the difference in the value added to the product through various services/functions is taken into account.

2) Such studies help in estimating the total cost incurred on the marketing process in relation to the price received by producer and the price paid by the consumer. The cost incurred by each agency in different channels and the share of each agency in the cost has been revealed. This knowledge ultimately helps us to identify the reasons for high marketing costs and the possible ways of reducing them.

3) The knowledge of marketing margins helps us to formulate and implement appropriate price and marketing policies. Excessive margins point to need for public intervention in the marketing system.

Estimation of marketing margins and costs:

1) **Marketing margin**

$$MM = Pri - (Ppi + Cmi)$$

Where, Pri = total value of receipts of goods

Ppi = purchase value of goods

Cmi = cost incurred on marketing

2) **Marketing cost**

The total cost, incurred on marketing either in cash or kind by the producer and of various intermediaries involved in the sale and purchase of the commodity till the commodity reaches the ultimate consumer may be computed as follow-

$$C = c_f + c_{m1} + c_{m2} + c_{m3} + - - - - - - - - - - - - - +c_{mm}$$

Where, C= total cost of marketing of the commodity

c_f = cost paid by the producer from the time the producer leaves the farm till he sells it.

c_{mi} = cost incurred by the i^{th} middleman in the process of buying and selling the product.

The studies on the estimation of marketing costs and margins in India have revealed that:

A) There is a wide variation in the producer's share in the consumer's rupee, the marketing costs and the margins of the middlemen in different regions.

B) The marketing margin or the middleman's share is relatively large and the farmer's

share is small for those commodities, which undergo elaborated processing operations—e.g. prawns or shrimps.

C) For highly perishable commodities like fruits, milks, fishes, the middlemen's share is much higher than the farmer's share, other things remaining the same.

Factors affecting marketing cost: The factors that affect the marketing costs are:

i. Perishability of the product.

ii. Extent of loss in storage and transportation.

iii. Volume of the product handled

iv. Regularity in the supply of the product.

v. Extent of packaging.

vi. Extent of adaptation of grading.

vii. Necessity of demand creation likes advertisement.

viii. Bulkiness of the product.

ix. Need for retailing.

x. Necessity of storage.

xi. Extent of risk.

xii. Facilities extended by the dealers to the consumers.

Reasons for higher marketing costs of fish and fishery products: Generally, cost of marketing of fish and fishery products, is higher than that of manufactured products. The factors responsible for this phenomenon are:

1) Widely dispersed farms and small output per farm

2) Bulkiness of fishery products.

3) Difficult grading.

4) Irregular supply.

5) Need for storage and processing.

6) Middlemen.

7) Risk involved like risk of price fluctuation.

Marketing cost in India and other countries:

In India, the marketing cost of fishes is lower than in developed countries. The farmer's share in the price paid by the consumer is higher in India than in developed countries. The factors responsible for those differences are:

a) Fishes are sold in a relatively unprocessed form in India, whereas in developed countries, consumers want them mostly, in a processed form. Therefore, the cost of marketing is lower, and the farmer's share on consumer's rupee is higher in India.

b) Human labour is relatively cheap in India, a fact that keeps the labour component of the marketing cost lower in India than in the developed countries.

Marketing Efficiency

Definition: The concept of marketing efficiency is so broad and dynamic that no single definition encompasses all of its theoretical and practical implications. Some definitions are given below:

Kohls and Uhl: Marketing efficiency is the ratio of market output (satisfaction) to marketing input (cost of resources). An increase in this ratio represents improved efficiency and a decrease denotes reduced efficiency. A reduction in the cost for the same level of satisfaction or an increase in the satisfaction at a given cost results in the improvements in efficiency.

Jasdanwalla: The term marketing efficiency may be broadly defined as the effectiveness or competence with which a market structure performs its designated function.

Efficient Marketing:

The movement of goods from producers to consumers at the lowest possible cost, consistent with the provision of the services desired by the consumer, may be termed as efficient marketing. A change that reduces the cost of accomplishing a particular function without reducing consumer satisfaction indicates an improvement in the efficiency. But a change that reduces costs also reduces consumer satisfaction need not indicate increase in marketing efficiency. A higher level of consumer satisfaction even at a higher marketing cost may mean increased marketing efficiency if the additional satisfaction derived by the consumer outweighs the additional cost incurred on the marketing process.

Approach to the Assessment of Marketing Efficiency:

a) Technical or physical or operational efficiency: - This aspect of efficiency pertains to the cost of performing a function. Efficiency is said to have increased when cost is reduced for performing a function for each unit of output. This can be brought

about either by reducing physical losses or though change in the technology of the function viz. Storage, transportation, handling, and processing. A change in the technique may result either in the reduction of per unit cost or the increase in the output for a given level of cost.

b) Pricing or allocative efficiency: -Pricing efficiency means that the system is able to allocate farm products either over time, across the space or among the traders, processing and consumers (at a point of time) in such a way that no other allocation would make producers and consumers better off. This is achieved via pricing of the product at different stages, at different places, at different times and among different users and hence called pricing efficiency.

Empirical Assessment of Marketing Efficiency:

Ratio of Output to Input: - Conceptually, efficiency of any activity or process is defined as the ratio of output to input. If " O "and " I " are respectively output and input of the marketing system and " E " is the index of marketing efficiency; then

$$E = \frac{O}{I} \times 100$$

A higher value of E denotes higher level of efficiency and vice versa. When applied in the area of marketing, output is the 'value added' by the marketing system and input is the 'real cost' of marketing (including some fair margins of intermediaries).

The measurement of ' value added' is not easy. The difference in the price at the farm level (price received by the farmer) and that at the retail level (price paid by the consumers) may be used to measure the 'value added'.

Shepherd has suggested that the ratio of the total value of goods marketed to the marketing cost may be used as a measure of efficiency. The higher the ratio, higher will be the efficiency and vise versa. Shepherd's idea can be expressed in a slightly modified form as follows;

$$ME = \left(\frac{V}{I} - 1\right) \times 100.$$

Where, ME = Index of marketing efficiency.

V = Value of the goods sold or price paid by the consumer (retail price).

I = Total marketing cost or input of marketing.

This method eliminates the problem of measurement of value added.

Marketing costs and efficiency:

Generally, high marketing costs and margins are considered to be indicators of

inefficiency in the marketing process. But this is not always true. The fact that a major part of the consumers' rupee is spent on marketing costs does not always mean that something is wrong with the distribution system. A number of factors may operate to cause a high proportion of marketing costs, without any reflections on the efficiency of the marketing system:

i. Place of production.

ii. Time of production

iii. Form of production.

CHAPTER XIX
MARKET EQUILIBRIUM AND MARKET STRUCTURES

Introduction

The price of a product and quantity that is actually bought and sold in the market is determined by the interaction of buying decision of the house hold and selling decision of the producers i.e. the interaction of supply and demand. The point at which quantity demanded of a commodity equals supply of that in the market is called the Market Equilibrium of that commodity. As a result, there will neither be a shortage nor surplus of that commodity in the market.

There are an infinite number of market situations in the Mixed economy of India. At one extreme, we may find a single producer dominating a particular market. At the other we discover thousands of firms, each of which supplies a minute fraction of the total of market output. Between these extremes lie an almost unlimited variety of market arrangements. Study of each and every market situations will be a difficult task. Hence, we seek more realistic objective- to define several basic market structures or models.

In no case will the market models we are about to define will provide a detailed explanation of the functioning of any of the firm. Furthermore, some firms and industries will not fall neatly into with in any of the market model we define in this chapter; rather they may bear characteristics of two or more of these models. The four basic market structures found in any economy are mentioned in this chapter.

Market Equilibrium

Equilibrium is a term often used in economics, and it means a situation, which is at rest, i.e. there is no force acting to change the situation, and so the situation is maintained without alteration. The equilibrium price and equilibrium out put are those levels of out put and price, which are at rest i.e., nothing in the market force them to change and they are maintained.

Market equilibrium is a state of market in which the quantity demanded of a commodity equals the quantity of that product supplied in the market. Here the supply and demand are put together to see how the interaction of the buying decision of the house holds and the selling decision of the producers will determine the price of product and the quantity which actually brought and sold in the market.

With help of an example we will try to know more about market equilibrium, the

equilibrium price and the equilibrium quantity. In the table no 19.1, column one shows the quantity of carps supplied in the market in one week, 2- price schedule 3- demand schedule and column no: 4- shows the position of the product in the market. (Surplus or shortage) The arrows indicate the effect on the price.

We assume competition- a large number of buyers and sellers.

Table no: 19.1 Market supply and demand for carps.

1 The quantity of carps supplied per week	2 The price per kilo (Rs)	3 The total quantity demanded	4 Surplus or shortage (Arrows indicate effect on price
12,000	50	2,000	+10,000 ↓
10,000	40	4,000	+6,000 ↓
7,000	30	7,000	0
4,000	20	11,000	_7,000 ↑
1,000	10	16,000	_15,000 ↑

Now the question to be faced in this, of the 5 possible prices at which fish might be sold in the market which will actually prevail as the market price for carp?

Let us derive our answer through trial and error. For no particular reason, start with examination of Rs 50. Could this be the prevailing price? The answer is no: for the simple reason that producers are willing to supply to the market 12,000 kilos of fish at this price while the buyers, on the other hand are only willing to take 2,000kilos off the market at this price. In other words, the higher price of fish discourages the buyers from purchasing more. Here for the buyer, other products (vegetable or other meat) appear to be "better products" when the fishes are high priced. The result in this case is 10,000-kilo surplus of fish in the market.

Could a price Rs 50 even if it is existed in the market temporarily – persist for a longer period of time? Certainly not. The very large surplus of fish would prompt the competing sellers to bid down the price in order to encourage the buyers take this surplus off their hands. Suppose price gravitates down to Rs 40, now the lower price encourages the buyers to take this surplus off the market. And, at the same time has induced the fish farmers to use a smaller amount of resources in producing the fish. The surplus as a result has decreased to 6,000kilos because the surplus still exists, competition among sellers will once again bid down the price of fish. We can conclude then that the price

of Rs50 and Rs 40 will be unstable, because they are "too high". The market price will be still less than Rs40.

Jumping in to other end of our price column and examine Rs10 as possible market price for the fish. It is evident that the quantity demanded is in excess of quantity supplied by 15,000 units. This relatively lower price discourages farmers from devoting their resources to fish production; the same low price encourages consumers to attempt to buy more fish than would otherwise be the case. Fish is a "good buy" when its price is relatively low. In short there is a 15,000kilo shortage of fish in the market. This price of Rs 10 cannot persist as the market price, because the competition among the buyers bid up the price to somewhere greater than Rs 10. In other words, at a price of Rs 10, many of the consumers who are willing and able to buy are left out in the cold. Many potential consumers in order to ensure that they will not have to do without will express a willingness to pay some price in excess of Rs10 to ensure getting some of the available fish. Suppose this competition of bidding up the price by buyers boost the price of fish to Rs 20. This higher price obviously has reduced, but not eliminated, the shortage of fish. For Rs 20, farmers were willing to devote more resources to fish production. A shortage of 7,000Kg still exists in the market at a price of Rs 20/-. We can conclude that competitive bidding among buyers will push the market price somewhere above Rs 20.

By trial and error we have eliminated every price but Rs 30, and only at this price, the quantity which farmers willing to produce and the supply in the market are identical with the amount consumers are willing to buy. As a result there is neither surplus nor shortage of fish in the market at this price. It is seen that a surplus causes price to decline and shortage causes price to rise. With neither a surplus nor a shortage at Rs 30, there is no reason for the actual price of fish to move away from this price. The economists call this point as the "Equilibrium Point". And the price as "Equilibrium price". The quantity of the product at which the market reaches equilibrium as the "Equilibrium Quantity". Therefore the market equilibrium can be defined as the condition of the market at which the quantity demanded of the product is equal to the quantity supplied.

i.e., Market equilibrium is when demand = supply

$$(E = Qd = Qs)$$

Discrepancies between supply and demand intentions of the sellers and buyers, respectively, will prompt price changes, which subsequently will bring these two sets of plans in to accord with one another.

A graphic analysis of supply and demand should yield the same conclusions. Figure 19-a puts the market supply and market demand curves for fish on the same

graph, the horizontal axis represents both demand and supply. A close examination of this clearly indicates that at any price above the equilibrium price the quantity supplied will exceed the quantity demanded. This surplus will cause a competitive bidding up of the price by sellers eager to relieve themselves of their surplus. The falling price will cause less fish to be offered and will simultaneously encourage consumers to by more. Any price below the equilibrium price will entail a shortage; that is, quantity demanded will exceed quantity supplied. Competitive bidding by the buyers pushes the supply up towards the equilibrium level. And this rise in supply will simultaneously bring forth a greater supply from producers and the rational buyers out of the market, thereby causing the shortage to vanish. Graphically, the interaction of the supply curve and the demand curve for the product will indicate the equilibrium point.

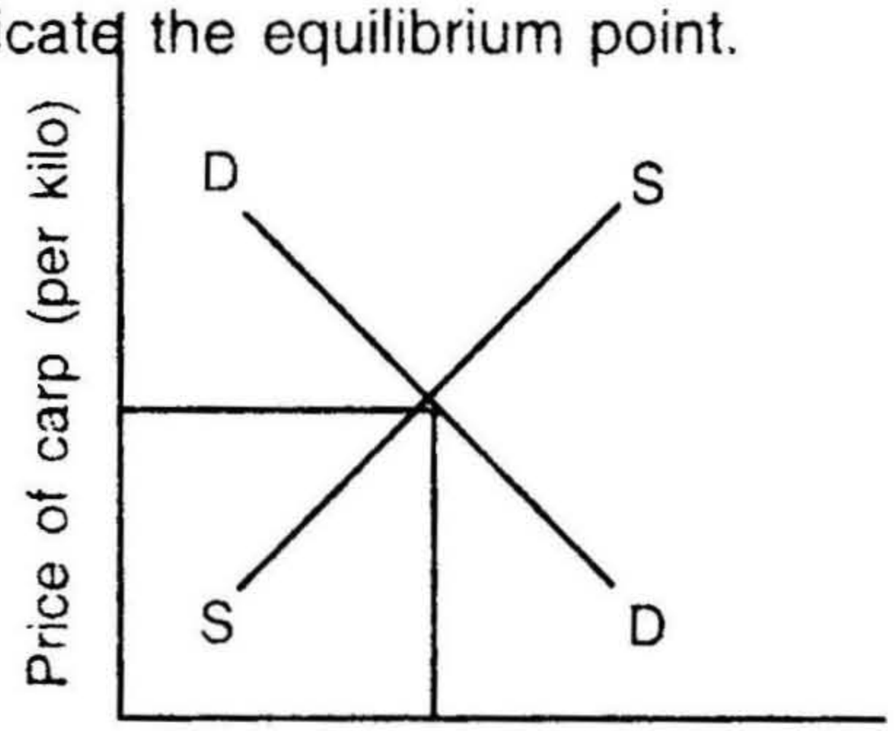


Figure19.1 Market supply and market demand curves for carp

Market structure

Studies of market structure for the fish and fishery products have concentrated primarily on the marine or seafood industry. Aquaculture market was given little attention until recently. Limited studies on the aquaculture market structure conduct have been restricted generally to the processed aqua cultural products. Thus, it is especially important to examine marketing conditions related to aquaculture with respect to both fresh and processed products. Such an examination begins with basic marketing concepts.

Market structure is the term given to the organizational characteristics of the market, which influence the nature of the competition and pricing with in the market. The structure of the market determines the type of behavior or the conduct, which prevails in the market. The market structure for various products encourages certain distinct type of market conduct

Market conduct refers to the pattern of competitive behavior, which market participants exhibit in adjusting to the market In which they are participating. Four important

types of competitive behavior in varying degrees are found in the food industry, Perfect competition, Oligopoly, Monopolistic competition and monopoly: all of which are likely to be found in one segment or the other.

The significance of the market structure

The revenue behavior of the firm is determined by the characteristics of the market in which the firm operates. How many firms supplying the market? Are the firms large or small? Are the products supplied by these firms similar or different from one another? Is it easy or difficult for new firms to enter the market? The answers to these questions are aspects of what is termed as market structure, which may be defined as the characteristics of market, which are likely to affect a firm's behavior and performance. Thus, revenues to firm will vary according to the market structure.

The two basic extremes are

(a) Perfect competition-Where competition in its most perfect form prevails.

(b) Monopoly- where there is no competition what so ever.

Then, within these to extremes, we look at the various forms of imperfect competition

The fact that, both the perfect competition and the monopoly are unrealistic (as neither is likely to exist in the real world)

A simple diagram can be used to show the different market situations:

Perfect competition ◄——— Imperfect competition ———► Monopoly

Monopolistic Oligopoly

Competition

They can be briefly described as follows:

Perfect competition:

The purest form of competition, where a large number of buyers and sellers compete to produce a standard good.

Imperfect competition:

Covers all other market situations, ranging from highly competitive markets (though competition is not "effect") to what where only few producers control the output. It is a general term, covering a variety of several possible market situations.

Monopoly:

Where only one seller produces the good

Oligopoly:

An example of imperfect competition. A few firms dominate the market. An extreme form of oligopoly exists where only two firms exist in the industry. (Duopoly)

Monopolistic competition:

The other extreme of imperfect competition, where many sellers compete with each other. But competition is not perfect—the goods are slightly different from each other as firms practice product differentiation and branding.

Pure Competition

The competitive model is based on some of the assumptions, which are very stringent and unlikely to be satisfied in any real world market. Industries that do exhibit many of the following characteristics are said to be perfectly competitive.

According to the theory, under perfect competition, demand for most commodities come from a large number of buyers who act quite independently from one another, rarely making any conscious effort to influence price. Supply is also provided by many small producers whose individual production not sufficient to influence market price. Therefore, the essence of conception is that market is entirely personal. That is the bargaining strength of the buyers and sellers are weak.

The perfect competition model possesses the following characteristics.

1. Each economic agent acts as if price is given, i.e. each acts as price taker.
2. The product is homogenous.
3. There is free mobility of all the resources including free entry and exit of firms and
4. All economic agents possesses complete and perfect knowledge of the market Small-scale fishermen in many countries are considered as perfectly competitive. Fishermen use open access resources and there are numerous operators

Condition for pure and perfect competition

Price-taking buyers and sellers.

In this economic model, the fish producer or the marketing agent do not take in to account the effect of behavior in price when making a consumption or production decisions.

The firm usually is of small, relating to the market, as a whole, and can not exert a perceptible influence on price.

Homogenous products

The products must be virtually identical. The product of one seller is same as that of another. This indicates that the buyers are indifferent as to the firm which to purchase. If buying cat fish, the purchaser evaluates the catfish from producer A as being the same as from producer B Then the product can be considered homogenous.

Free mobility of resources

All resources must be perfectly mobile. That is, each resource must be moved in and out of the market readily in response to monetary sign. This is only so, however, in the long run since time is required to change fish production facilities. Land use patterns and regulations may also affect resource mobility. If the land must be leased, resource mobility must be restricted.

Perfect knowledge

Consumers, producers, and resource owners must possess perfect knowledge if market is to be perfectly competitive. If purchasers are not fully cognizant of prices, they might buy at higher price when lower ones are available. Producers must know their cost as well as their price in order to attain most profitable rate of out-put. Since few cases occur where there is absolute knowledge of the market by both producers and consumers, it is sufficient to say that perfect competition may exist where there is high level of knowledge about competing products.

Advantages of perfect competition

The following are the some of the advantages of the perfect competition.

a) Efficient allocation of resources. To make the best use of the scarce resources is of central concern to the economists and the way to do that is to produce what the consumer wants.

b) Automatic allocation of resources in response to changes in demand. A speedy reallocation of the resources is achieved through free entry and exit of the firms with the profit motive and thus the economy operates efficiently.

c) Inefficient firms are eliminated. This not only results in efficient firms remaining in the market, but also serves as an incentive to further gains in efficiency.

d) The consumer is not exploited. The price of the goods, in the long run, will be as

low as possible since only normal profits (and no excess profits) are earned in the long run and these are the minimum level of profits necessary to keep the firm in the industry.

It is for these reasons that perfect competition is regarded as the ideal to be aimed at. However, such a situation can have certain disadvantages

Disadvantages of Perfect competition.

a) High degree of duplication among the firms and consequent wastage due to large number of small firms.

b) Economies of scale may not be achieved in an industry where the typical firm is a very small part of the total industry.

c) There may be a lack of innovation in situation of perfect competition because, high expenditure on research and development and the fact that the innovations would be merely copied.

Uses of the theory of perfect competition

The study of perfect competition enables us to see:

- How competition operates in the real world – even though it is not " perfect". It especially shows us the role of profit and price.
- The advantageous feature of perfect competition that can be secured in the real world.
- The disadvantageous features of perfect competition to be avoided.
- A standard against which to gauge the extent of competition prevailing in the market. We can see how near a " real world" market can get to the " ideal form" of perfect competition.

The fish farmer under perfect competition

In these circumstances, the farmers produce fish that are undifferentiated from those of his competitors and form a relatively insignificant part of total supplies. Here the market price is determined by the interaction of forces of supply and demand. For the farmer, average revenue becomes a constant and is equal to market price (AR=Ppc), and his output decision is influenced by the relationship between this and his costs, which he can influence. To maximize his profits, he will need to produce where marginal costs equals marginal revenue (MC=MR), and as MR=AR, then he will produce where

MC=MR=AR=Ppc. He will earn 'normal profits' only. If he earns less, he will have to leave this activity, and if he earns more in the short run then new firms will enter in the long run, pushing profits back to normal levels. As fish is customarily sold in a form of undifferentiated by producer, perfect competition may well be typical of much aquaculture in general terms, although in practice firms tends to experience different cost structures and have a little localized price discretion. For perfect competition—or anything approaching it –to exist, it is crucial that barriers to entry are very low or insignificant there by permitting easy entry if profits are sufficiently attracting.

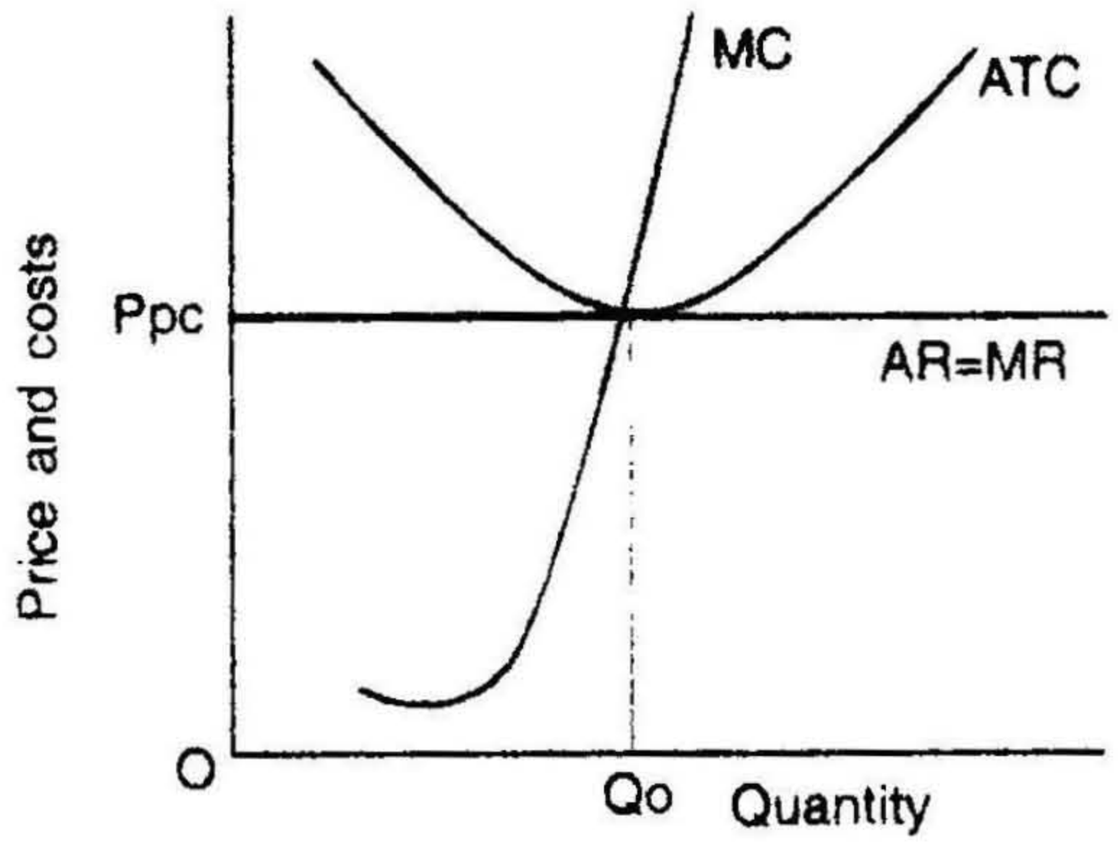


Figure 19.2. The fish farmer under perfect competition.

Monopoly

Monopoly is the term used for the market situation where there is only one supplier. Since the monopolist firm is the only supplier of a product the demand curve that it faces is the market demand curve. The monopolist's short run cost will have the same shape as those of the firm in perfect competition because both face identical technology.

Disadvantages of monopoly

The disadvantages sited are:

- Out put restricted below what it would have been under competition. This means that monopolist is not producing enough to fully satisfy demand, i.e. is not using enough productive resources (the factors of production). To the economist this is the main advantage of monopoly- that there will be a *misallocation of resources*. People want the commodity, are prepared to pay a price it that will cover its costs, yet the output- restricting monopolist will not fully meet their demand.

- From the consumer's point of view, the price of the commodity is higher than it would have been under conditions of competition. He is being "exploited".
- The monopolist is making a permanent excess profit at the expense of the consumer. This considered being unfair.
- The lack of competition tends to make the monopolist complacent and less efficient. He has no incentive to become more efficient when he is already making excess profits as a result of his monopolist position.
- The efforts of the monopolist will be concentrated on keeping out new entrants into his industry in order to maintain his monopoly power. This is how he will maintain the excess profits. All his efforts and ingenuity could have been better spent on improving efficiency.

Advantages of monopoly

It has become increasingly apparent that there are certain advantages from a situation of monopoly, and it is not necessarily all bad. These are the possible advantages:

- Long-term planning. The monopolist is secure; he does not have to worry if he will be around in the future to reap the rewards of any innovation that he may be making now. He knows that he will be around, and so can take long-term view of innovation, investment etc., which only pays off in the long run. There for he will be able to

  (i) Innovate, knowing that the benefits will accrue to him;

  (ii) Make long-term plans for investment programmes.

- Economies of scale. By being large, the monopolist can reap economies of scale. This can enable him to become more competitive in export markets (often a degree of monopoly power in the domestic market is necessary to achieve a strong export position).
- Research. Only the larger firms can undertake the vast amount of research needed in modern economy. No small firm could afford the high cost of research programmes.
- A more stable market. Whereas competition involves frequent changes in price, number of firms etc., a situation of monopoly is more stable. Price will not be subjected to fluctuations and conditions will be more stable.

The fish farmer as a monopolist

It is possible for a firm to enjoy the monopoly power in being effectively the sole supplier for out put to the market. To do so it would have to produce a clearly differentiated product (for example, to be the only supplier of hatchery seed). It may then set a price in relation to the market demand curve (which now becomes its demand curve) without reference to competitors, and the customary analysis suggests that it will set a higher price than the equivalent price under perfect competition, with lower total production; profits are above normal, protected now by significant barriers to entry. Again, it seeks, as a profit maxi miser to produce where MC = MR, giving price Pm.

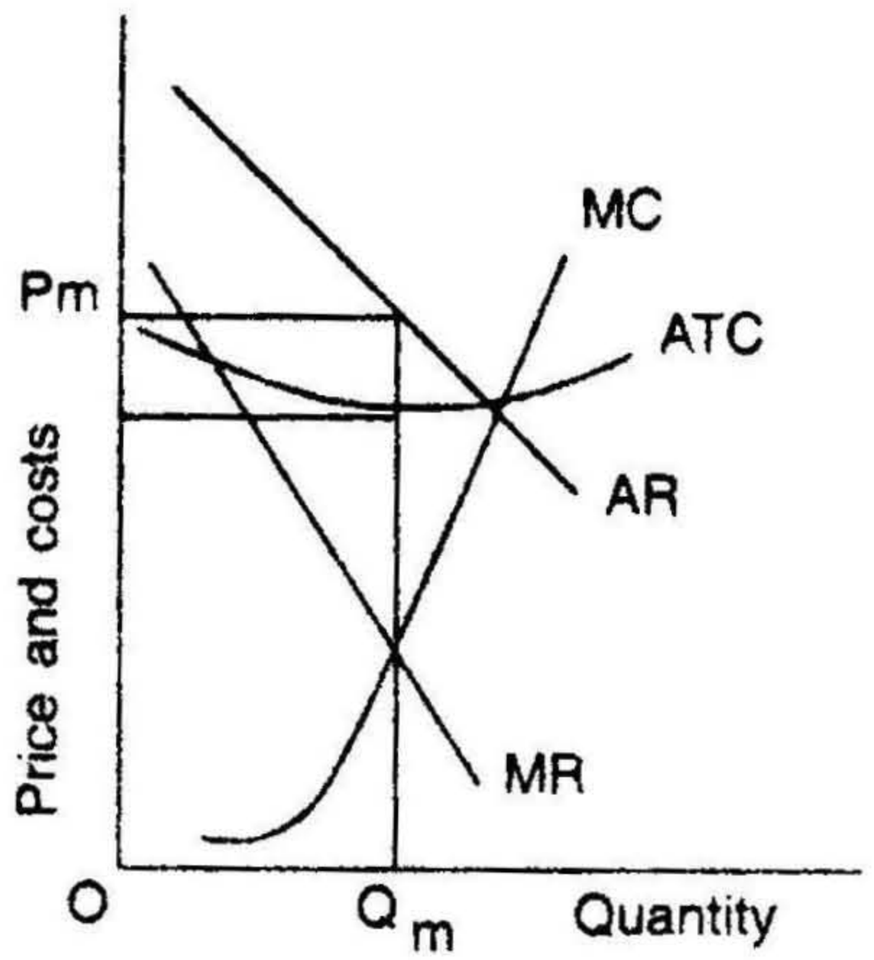


Figure 19.3 The fish farmer as a monopolist

Market structures in aquaculture appear to vary widely, from those approximating quite closely to perfect competition to situations close to classical monopoly. For the most part however, intermediate market situations exist;

There can be little doubt that one of the key factors in the industrial structure of aquaculture is the existence of, or otherwise, of barriers to entry, and these merits some specific attention.

Barriers to entry

Barriers to entry in aquaculture may be defined as factors that cause a potential entrant firm to face production cost higher than those of existing firms, or which prevent ('blockade') its entry.

Potential entrants attracted to aquaculture by the existence of profits, acting as a 'signpost' that production can be profitable. However, what may constitute accepted levels of profits is debatable, for in aquaculture a relatively high rate of return will be necessary

to overcome the problems of market variation, operational problem and various production hazards. For example, Saunders-Davis (1977) suggested that a rate of return on capital of 30% p.a. was necessary in trout farming in the United Kingdom. The problems are compounded by the need to wait several years before the profit emerge; Needham (1981) reports anticipated delays as long as ten to twelve years before profits became positive, and Kurtyanic (1982) suggests eight to ten years. During this period, cash flow problems would become critical, especially for the single-farm unit.

We can categories barriers to entry as follows:

(a) Absolute cost advantages: where the cost of established firms are lower than those of a potential entrant whatever the scale of operation. Important reasons for the cost advantage include the high cost and the limited availability of capital, which puts new small firms at marked disadvantage, and existing firms control over the most favorable sites in terms of water supply and quality in relation to cost.

(b) Key input availability: the potential entrant is unable to obtain the inputs in suitable quantity and at suitable prices to compete. For example, the existing farms will have all the available skilled labour or control over the out put of the monopolistic hatcheries; or the entrant might be at cost disadvantage in obtaining supplies of seed or fry, or feeds.

(c) Technology availability: the potential entrant unable to acquire the relevant technology (or know-how), perhaps because it is patented, or held as a commercial secret, or based on skills acquired over time. For example some forms of salmon farming, knowledge of the marine engineering of cages is a crucial determinant of success.

(d) Economies of scale: if these exist, the entrant will face the need to invest in the entry at substantial scale or face higher cost at lower scale. Will face the risk of post-entry price cuts by existing firms to drive them out, especially if those firms have spare capacity available to absorb any increase in sales.

(e) Consumer loyalty and product differentiation: entrants face the twin problem of winning customers away from other farmers' fish and/or capture fish. Not only will brand loyalty have to be overcome but also their product may seen as non-identical to capture fish (e.g. it may be seen as fattier, looser muscled, or have different coloring) and consumer resistance will have to be overcome in both cases (thereby increasing costs)- by advertising campaigns, for example. Any brand advertising by the existing farmers will heighten this barrier.

(f) Legal barriers: these may be an important source of deterrent in the form of

various legal restrictions inhibiting or preventing the establishment of fish farms. These restrictions may concern factors such as waste disposal, disease control, or access to shore areas. Licenses to produce may be needed (as for salmon in Norway), and there may even be problem with ownership of the fish themselves, such as in any ranching of salmon, and in obtaining any exclusive rights in inshore waters.

(g) Entrepreneurial excellence: although less tangible, the excellence of the entrepreneur may itself confer such advantages to existing firms that potential entrant could not compete effectively. As aquaculture involves elements of craft as well as science, the combination of experience, knowledge, and ability with in the existing firms can be a very powerful barrier to others, especially in increasingly high-technology industry.

Barriers to entry confer advantages to existing firms in, among other ways, allowing them discretion over prices. However, such barriers may also inhibit the development of aquaculture as an industry in any country, and are there for important on wider level. Although such barriers as those above may be identified, there are other factors that tend to diminish dynamically the significance of barriers to entry. These diminishing factors include especially the existence of expanding demand, permitting both old and newly established firms to prosper. Technological change, conferring an advantage the latest inventor, and the presence of fish supplies coming from wild fish or international trade, both diminish barriers. Entry by firms already established elsewhere, especially large firms, might overcome barriers, and government policies deliberately aimed at reducing them may operate, including active encouragement of new entry. Government may help to break down the barriers by making cheap credit available, supplying seeds, assisting with marketing and training personnel.

Monopolistic Competition

This term describes a situation that includes all of the conditions for perfect competition except the assumption of homogenous products that is in an imperfectly competitive market each producer sells the product that is somewhat differentiated. Differentiated goods exists where consumer do perceive differences in quality between brands produced by different firms. This is much closer to a realistic theory of market behavior in as much as most firms do attempt to make their goods or services different from that of their competitors. E.g., by advertising, packaging or branding. Thereby the firm tries to generate what is known as brand loyalty.

How product differentiation is achieved

There are varieties of ways by which basically similar products can be differentiated. The main methods are:

a) Branding. Goods are given distinctive name and identity.

b) Packaging. This can be distinctive, and can thereby reinforce the brand image.

c) Advertising. This not only drives the consumers' attention to the branded products, but can also help to support the "image" of the brand—thus further helping to create a degree of individuality for the product. This advertising is generally "persuasive" in character, rather than "informative".

d) Actual differences on the product. A firm can have some special knowledge or possess some special resources, whereby its out put is actually different from its rivals. The beer from one brewery will taste different from that of another brewery, due to differences in the yeast and the water.

Advantages of product differentiation

In looking at the advantages of product differentiation, it is necessary to distinguish between those for the firm itself, and those for the consumer.

(a) For the firm

(i) The ability to maintain excess profits, even in long run.

(ii) If the consumer remains "loyal" to the differentiated product, then there will be greater stability of sales. The firm will not have to be subject to the unpredictability of intense competitive behavior

(b) For the consumer

(i) The quality of the product is consistent; therefore the consumer knows what he is buying.

(ii) The different products can be geared to meet the different tastes and incomes of the consumer, e.g. some consumers wants the highly packaged convenience foods; some cigarette smokers want the De lux brands with the "up-market image". Thus consumer choice is widened.

Disadvantages of product differentiation

(a) The basic argument against product differentiation is the same as that against any

of the imperfections of competition, namely that it reduces the degree of competition in the market. It does this in two ways:

(i) It reduces competition among existing firms, because consumers are reluctant to substitute one product for another because they have been "persuaded" to remain loyal to it (this is mainly an argument against the persuasive advertising that support product differentiation).

(ii) It makes it more difficult for the new firms to enter the industry in the long run if the consumers are already loyal to the existing products.

(b) All the effort and the expense that the firms put into product differentiation are wasteful. Too much is spend on packaging, advertising and design changes. The price of the good could be reduced instead.

(c) Too many brands on the market, produced by a large number of firms, could prevent the realization of full economies of scale in he production of the goods (the excess capacity theory)

(d) Consumer confusion! The costs of decision-making rise.

(e) Out put is at less than capacity and price is above the minimum average costs.

Oligopoly

The remaining market model – oligopoly—is less precisely defined by the economists than are the three other market structures discussed earlier. Two reasons go for to explain this lack of preciseness. On the one hand, oligopoly includes wider range of market structures than do the other three market models; in effect it embraces all the remaining market situations which do not fit the rather clearly defined market models of pure competition, and pure monopoly. On the other hand, as we shall discover in a moment, oligopoly has certain characteristics, which make it difficult to come up with hard and fast predictions about the oligopolistic industries.

1. The basic characteristic of oligopoly is "fewness." Oligopoly exists wherever a few firms dominate the market for a product. When we hear of the "Big three," " Big four," or "Big six," we can be relatively sure that the industry is oligopolistic. This does not mean, of course, that the Big three or four necessarily share the total market. The dominant few may control, say, 70 or 80 percentage of the market, with a competitive fringe—a group of smaller firms—sharing the remainder.

When a few firms dominate a market, each of these firms will have the share of

the market sufficiently large so that its actions and policies will have repercussions on the other firms because each firm supplies a large portion of the total industry output, actions taken by any one firm to improve its share of the market will directly and immediately affect its rivals. Hence, each firm must carefully weigh the expected reaction of its rivals when considering changes in product price, advertising outlays, product quality and so forth. Such clear-cut mutual interdependence is characteristic of the oligopoly. It is not present in pure competition or monopolistic competition because of the large number of the firms involved. The pure monopolist has no need to worry about rivals, because he has none. Indeed, it can be said that oligopoly exists when the number of sellers is so few that the actions of one firm will have obvious and significant repercussion on the others. The firms in oligopolistic industry are all in the same boat. If one rocks the boat, the others will be affected and in all probability will know the identity of responsible firm and can retaliate.

2. Oligopolist may be producing virtually standardized product or differentiated products. Speaking very generally, those oligopolistic industries which are producing raw materials or semi- finished goods are typically offering virtually uniform products—steal, copper, zinc, lead and aluminum—a long with cement, rayon, explosives, industrial alcohol, and some building materials, are virtually uniform goods produced in market in which a few large firms are dominant. On the other hand, oligopolistic industries producing finished consumer goods are typically offering differentiated products to buyers. Firm implements, formulated fish or shrimp feed, prophylactics, and so forth are produced by oligopoplistic industries where in product differentiation is considerable

3. An individual oligopolistic firm's control over price tends to closely circumscribed by the mutual interdependence, which characterizes such markets. Specifically, if a given firm lowers its price, it will initially gain sales at the response of its several rivals. However these adversely affected firms will have little choice but to retaliate to recover their shrinking market share; they will match or even undercut the given firm to preserve their market share. The result may be a price war and possibly losses for all firms. Conversely, if a given oligopolist increases, the rival firms stand to gain sales and profit by adhering to their present prices. That is, a price-boosting oligopolist runs the risk of "pricing himself out of the market" to the benefit of his rivals. For both these reasons, there is a tendency for the firms in oligopolistic market not to alter their prices very frequently. Establishment of some sort of collusive agreement by a group of oligopolists (Cartels or Mergers) by which all firms either increase or decrease their prices as a group can avoid the potential

risk of pricing oneself out of the market. Under such a collusive arrangement the firms as a group can exert a control over price in much the same way that a pure monopolist can.

4. Obstacles to entry are typically formidable in oligopolistic industries. The ownership of strategic patents or essential raw materials by existing firms may virtually prohibit the entry of new firms. Furthermore, the technology of heavy industry may demand that a new competitor be a large-scale producer from the outset, thus ruling out the possibility of a new firm starting on a large-scale basis and in time expanding into a significant rival of existing firms. In addition, certain advantages of being established—that is, the mere fact that the existing firms are producing well known, highly advertised products and selling them through long-established marketing outlet—may work against the successful entrance of new firms into the industry. Yet in contrast to the perfect monopoly, entry is not usually blocked completely in oligopolistic industries. For example, new firms frequently enter the chemical and machinery industries. Entry into oligopolistic industries is difficult, but by no means impossible.

5. Oligopolistic industries frequently channel considerable amounts of resource in to advertising and other promotional activities. But the type and amount of advertising will depend upon whether or not the firms are producing standardized or differentiated products.

Advertising competition is likely to be stronger among the oligopolists who are producing differentiated products. For example, each major cosmetic producer or cigarette manufacturer will have a large budget for convincing the consumer that his product is all ways superior to the ones produced by the rivals. Such advertising is likely to be of a highly competitive ours-is-better-than-theirs nature. On the other hand, public relations advertising are the bill of fare for the oligopolists who are producing virtually standardized products. Skilled buyers who purchase these products know that any difference between the products will be negligible.

Quality competition may be intense under the oligopoly, particularly so when product differentiation prevails. The research and design departments of many oligopolistic industries are becoming increasingly important over the years. Indeed, it is through research and rapid product development that the entry of potential rivals into the industry may be thwarted.

The fish farmer within oligopoly

There are four main features that suggest that fish farming might often be usefully analyzed with in an oligopoly framework.

(i) Frequently there are relatively a few fish farms competing in the markets.

(ii) Generally, the more fish that farmers wish to sell, the more they will have to lower their price; i.e. they face a downward sloping demand curve, reflected in the average revenue curve in the figure 19.c

(iii) The products of individual farmers may be differentiated on a regional or national level; possibly by packaging and branding, or may be by the localized nature of the market, giving the individual some local market power.

(iv) Certain barriers to entry do exist to deter the potential entrants.

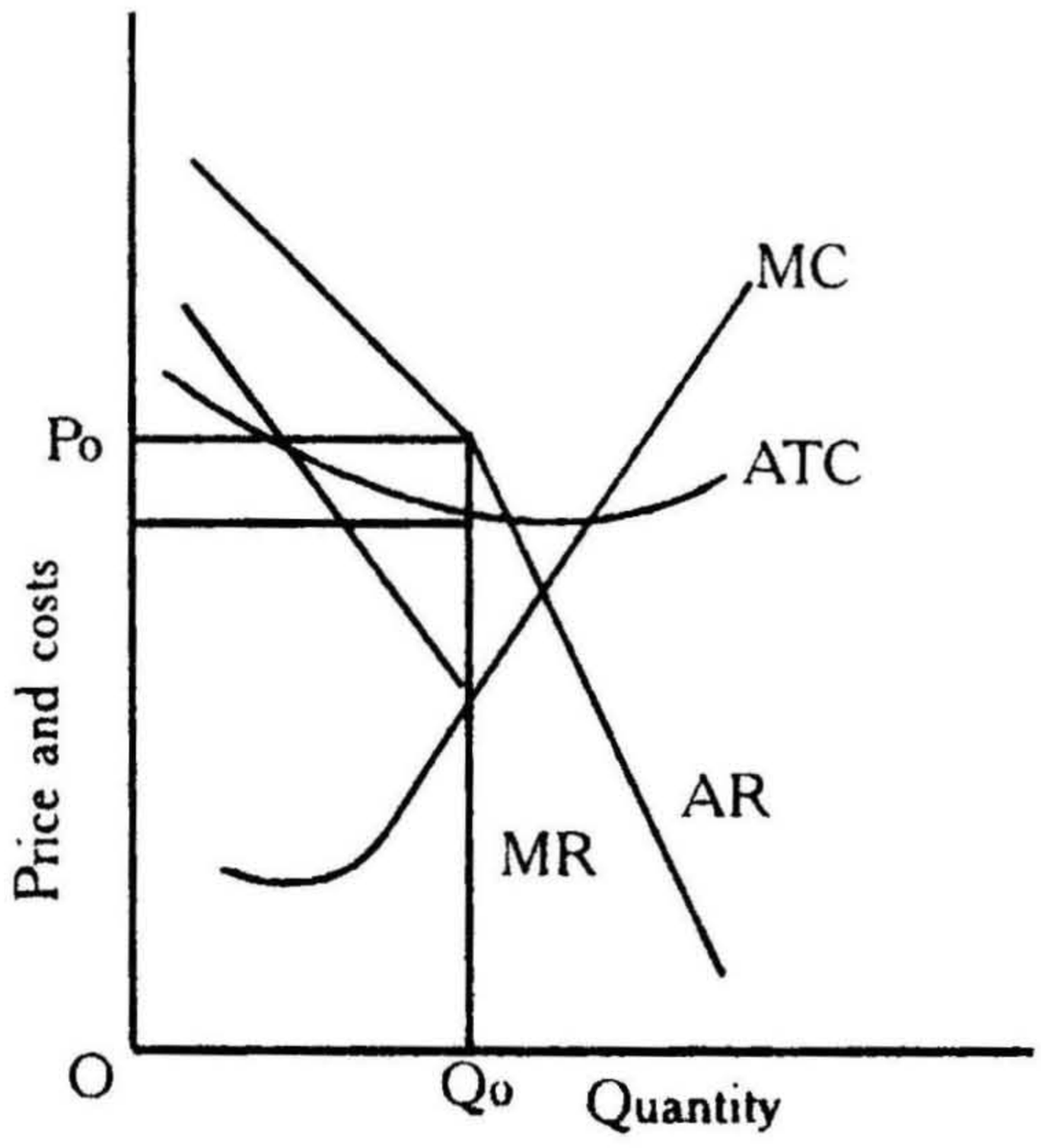


Fig .19.4 The fish farmer with in oligopoly

Thus oligopoly is typified by a downward sloping AR (and MR) curve, product differentiation to a degree, and fewness of sellers (i.e. high seller concentration). The individual farmer will again seek to maximize profits at MC = MR, but the exact nature of the behavior depends greatly on competition that does emerge. The diagram shows just one possible outcome, where the AR curve becomes kinked at the going price, Po, as competitors would wish to match any price cuts the individual farm makes, but not any price increases (= differential price elasticity). Profits now will be typically above normal,

as barriers to entry will be present here to deter the potential competitors attracted by the profits

Conclusion

Supply and demand in the market for goods, loans, labour time, and other factors of productions decides what to buy and what to produce. Partial equilibrium occurs when supply equals demand in one market; general equilibrium occurs when supply equals demand in all markets.

Equilibrium price and equilibrium quantity are the price and quantity supplied of a commodity at market equilibrium point of that commodity. Equilibrium quantity and equilibrium price will change in response to a change in demand or supply

There is a shortage if the price of a good is less than its equilibrium levels; there is a surplus if the price is above its equilibrium level.

Market analysis can be used to examine the outcome of the economic systems as a whole.

Every industry is characterized by differing degrees of competition. The market models of

a) Pure competition,

b) Pure monopoly,

c) Monopolistic competition, and

d) Oligopoliy are classifications into which most industries can be fitted with reasonable accuracy.

Table 19.2 Characteristics of the four basic market structures.

Charact-eristics	Pure competition	Monopolistic competition	Oligopoly	Pure monopoly
Number of firms	Avery large number	Many	Few	One
Type of products	Standardized	Differentiated	Standardized or differentiated	Unique; no close substitute
Control over price	None	Some; but with in rather narrow limits	Circumscribed by mutual interdependence considerable with collusion	Considerable.
Condition of entry	Very easy, no obstacles	Relatively easy	Significant obstacles present	Blocked.
Non price competition	None	Considerable emphasis on adver-tising, brand names, trademarks, etc.	Typically a great deal, particularly with product differentiation	Mostly public relations advertising
Example	Aquaculture and Agriculture.	Retail trade, clothing, shoes, etc	Farm implements, steel, sewing machines, electric fans etc	India railways, local utilities.

CHAPTER XX

INTERNATIONAL TRADE AND EXPORT

Introduction

Among the nations bordering the Indian Ocean, India is the largest one with a coastline of 8029 km covering 10 States and three Union Territories, and with a continental shelf area of 0.5 million sq. km and an Exclusive Economic Zone (EEZ) of 2.02 million sq. km. India is endowed with rich marine fisheries potential. Further, it has also vast inland fisheries resources such as rivers, canals (64,121 km), freshwater bodies (54.81 lakh ha) and brackish water bodies (14.12 lakh ha). Therefore, fishery sector in India has a very good potential for development (Govt. of India, 1992). Today it has emerged as one of the leading fishing nations not only in the Indo-Pacific region, but also in the world as a whole. In 2000, India ranked 3rd in the total world fish production and second in shrimp production. India's share of marine fish catch constitutes around 45 per cent of the Indian Ocean fish production and 2 per cent of world marine fish production.

Fish is one of the important sources of food to human population since times immemorial. Since the food on land available through agriculture is insufficient to feed the growing population there is need to seek alternative sources of food. According to UNO estimates, the world population has reached 6 billion by October 1999 and further increase is projected to reach 7.67 billion by 2020. Similarly, the Indian population also reached one billion very recently and further increase of population in the next millennium will be enormous. This calls for concerted efforts to increase fish production manifold so as to meet the problem of food security. Moreover, the changing food and consumption habits in the developed world and the need for foreign exchange for developing countries create ample opportunity to enhance the fish production levels of both capture and culture fisheries in marine and inland sectors.

Among the leading non-traditional exports, fish and fishery products play a prominent role contributing significantly to the success of India's export effort to bridge the yawning trade gap of India. They have become one of the major foreign exchange earners in the agricultural and allied sectors of India in recent years. Starting from mere scraps in the pre-independence period, it is a saga of steady, striking and sustained growth that the industry has recorded raising India's status and prestige and securing for her a respectable position among the maritime nations of the world (Subba Rao, 1990). Lop-sided development and exploitation of fisheries resource apart, compared to the foreign exchange earnings of less than Rs. 70 million in 1965, the marine products industry has taken a big leap forward during the last three decades reaching the level of export performance of the magnitude and dimension amounting to Rs. 4697 crores in 1997-98, which is an all-time high record. Scaling on unprecedented height was particularly considered beyond the reach of the industry in early 'Sixties on account of the dominance of this sector by

other maritime nations inter alias including USSR, Japan, South Korea, Mexico, Ecuador, Thailand and Indonesia which were exploiting the marine wealth in Indian seas with sophisticated large trawlers capable of remaining in the high seas for weeks at a stretch and equipped with on-the-board processing facilities. India now is poised to reach the target of Rs. 5000 crores worth of marine products exports at the end of Ninth Five Year Plan period. Thus the task in the Tenth Plan is to break from the past and set the stage for a sustained expansion in India's exports. Further, the Seafood Exporters Association of India has set an ambitious target of U.S $ 2 billion worth of seafood by 2002 AD. This is in accordance with the Government's policy to promote marine products as one of the thrust areas for a major expansion of exports in the coming years. The process of economic reforms and gradually opening up of Indian fisheries to world market is likely to turn the terms of trade in favor of fish and fish products creating more incentive environment than has been the case of preceding decades.

World trade in seafood has increased significantly during the last one and half decade. World import of marine products has been more than doubled from US $ 1600 million to $ 39200 million within the last 15 years (1980–1994) and it is expected to expand further due to growing appetite for seafood observed all over the world. Industrialized and advanced countries are the principal importers of marine products. Three principal markets, namely Europe, Japan and USA absorb nearly 80 percent of the volume. The UNO projections indicate that while the global demand for fish is likely to grow at the rate of two percent per annum in the coming years, supply is expected to step up at the rate of one percent indicating a vast opportunity.

India's share in the over all important trade of the world is 1.5 per cent which is very low when compared to some of the Asian Countries like China, Korea, Taiwan, Thailand, Indonesia, etc. whose shares have increased rapidly in the recent years. Within the last 15 years (1980-94) Thailand export has gone up from US $ 358 m to $ 4190, China's export from $ 348 to $ 2320, Indonesia's export from $ 180 to $ 1583, Korea's export from $ 681 to $ 1411 and India's export $ 261 to $ 1125 (FAO, 1996). Marine exports in India had crossed the $ one billion mark since 1994- 95 and it reached to $ 1.3 billion during the year 1997–98 (MPEDA, 1999). This shows that India is lagging behind many countries despite the existence of vast fisheries potential and therefore, India's role is not of much significance in the present global seafood trade

Though the share of agricultural exports in total exports of India in recent years declined, the contribution of fishery, a component of agricultural exports markedly increased for the same period. The share of fishery in total export earnings was 0.16 per cent in 1960-61, which increased to 2.02 per cent in the year 1970-71 and it became 2.95 per cent in the year 1990-91 and 3.7 per cent in 1997-98. These figures clearly show that fishery sector's share is growing at a faster rate than the rest of the economy. Moreover, this growth was also more stables compared to the other agricultural exports (Ravisankar et al., 1995; Suresh Pal, 1992). Another interesting aspect is that the unit value of

seafood exports were the second highest i.e. next to cashew kernels among the agricultural produce exported from India (Gopinath et al. 1993

Table 20.1. Growth Rates of Seafood Products Exports 1961 – 1998

Period	Quantities .	Value	Unit Value realization
1961	-	-	-
1966	-	45.47	39.08
1971	15.54	37.94	12.61
1976	16.53	71.84	30.29
1981	4.26	11.38	6.29
1986	3.69	12.28	7.25
1991	16.50	35.08	10.18
1996	23.41	42.47	8.78
1998	-7.17	8.13	17.86
1961-1998	44.63	3025.15	170.0

Table 20.2: Major Markets for Indian Marine Products

Markets		1988	1990	1992	1994	1996	1998
Japan	Q	34.86	30.38	20.00	17.94	18.30	22.21
	V	58.92	54.05	44.43	46.49	46.73	49.61
USA	Q	13.84	11.10	9.77	10.95	8.30	11.38
	V	12.32	11.26	10.49	13.70	10.88	13.34
European	Q	32.93	30.64	32.34	24.88	20.42	17.91
Union	V	20.39	24.87	29.87	21.17	19.25	14.80
Southeast	Q	9.40	21.22	29.16	41.20	46.68	38.49
Asia	V	4.44	6.88	10.14	15.86	19.22	16.56

Table 20.3: Growth rate of Indian marine export

Year	Quantity Tonnes	Value (Rs. Crores)	Unit Value Realization	Average Annual Growth Rate (%)		
				Quantity	Value	Unit Value
1961	17297	4.13	2.39	5.9	2.7	-
1962	11619	3.75	2.23	-32.8	-9.3	-0.1
1963	17908	5.86	3.27	51.1	56.5	46.6
1964	21458	6.85	3.19	19.8	16.8	-2.4
1965	15457	6.92	4.48	-28	-1.1	40.4
1966	19153	13.52	7.06	23.9	95.3	57.6
1967	21764	19.93	9.16	13.6	47.4	29.7
1968	24810	22.08	8.9	14	10.8	-2.8
1969	30584	33.07	10.81	23.3	49.8	21.5
1970	37175	35.54	9.56	21.6	7.5	-11.6
1971	34032	39.17	11.51	-8.5	10.2	20.4
1972	38271	58.13	15.19	12.5	48.4	32
1973	48785	79.58	16.31	27.5	36.9	7.4
1974	46629	76.31	16.37	-4.4	-4.1	0.4
1975	53412	104.91	19.64	14.6	37.5	20
1976	62151	170.86	28.96	16.4	71.4	47.4
1977	64964	179.74	27.67	4.4	-0.7	-4.5
1978	77946	212.16	27.22	20	18	-1.6

Marine Products Export Development Authority (MPEDA)

The MPEDA came into existence in 1972 under the Marine Products Export Development Act 1972 (No13 of 1972). The role envisaged for the MPEDA under the statute is comprehensive – covering fisheries of all kinds, increasing exports, specifying standards, processing, marketing, extension and training in various aspects of the industry.

The headquarters of MPEDA is located at Kochi.

Regional centres: Veraval, Mumbai, Cochin, Chennai, Vishakapatnam, Kolkata.

Sub regional centres: Goa, Mangalore, Quilon, Tuticorin, and Bhubaneshwar.

The authority operates two overseas trade promotion offices one at Tokyo (Japan) and the other at New York (USA) with resident directors as head of offices.

Structure, activities and network

MPEDA functions under the ministry of Commerce, Govt. of India and acts as a co- coordinating agency with different Central and state government establishments engaged in fishery production and allied activities.

The plan schemes of the authority are implemented under 4 major heads:

- Export production – Capture fisheries
- Export production – Culture fisheries
- Induction of new technology and modernization of processing facilities.
- Market promotion

Objectives

- Development, conservation and management of offshore and deep-sea fishing.
- Registration of exporters and processing plants.
- Laying down standards and specifications.
- Rendering financial or other assistance and service to the industry in relation to market intelligence, export promotion, trade enquiries and import of certain items required for the industry.
- Regulation of export of marine products.
- Imparting training in different aspects of marine products exports, with special reference to fishing, processing and marketing.

To provide effective, prompt and professionals service to the industry community abroad, MPEDA organises its operations through specialised divisions;

1. Statistics and market research
2. Marketing services
3. Research and product development
4. Development
5. Publicity and public relations
6. Quality control
7. Prawn farming

Marketing services:

- The marketing services division in MPEDA was born of the realization that production has to be maintained at the optimum level, distribution channels lubricated constantly, the customer serviced effectively on time.
- The growing range of services offered by MPEDA practically covers every phase of production and marketing: be it financial, technical or legal.

Financial services;

- MPEDA offers grants and subsidies to the industry from its own resources and recommends concessions and credits from other institutions.
- MPEDA offers funds for airlifting samples of new products to new markets.
- It organizes supplies of inputs like mafron gas, refrigerated units for frozen cargo vessels etc.
- MPEDA prepares feasibility reports on processing plants, cold storages, fishing vessels on the basis of which entrepreneurs can obtain finance from commercial

banks and other institutions.

- MPEDA makes recommendations to the Government of India on the import- export policy for the fishery industry and formulate incentive schemes.

Statistics and market research:

- Through its statistics and market research division, MPEDA keeps its finger on the pulse of the industry at home and abroad. The division is today a massive storehouse of information. The constant traffic of data to and from it has proved invaluable to the industry in its marketing efforts.
- MPEDA regularly collects comprehensive data on a wide variety subjects:
- Fish landing in India (state and species wise)
- Exports of marine products from India
- Exports of marine products into major markets like

Japan, USA and west Europe on the basis of source,

- Products and variety.
- On the basis of these data, MPEDA fixes product wise export target on annual basis and over the plan period.
- MPEDA collects information on day-to-day raw material prices at different landing centers in India.
- Once a week at least MPEDA analyses the export market situation for price movements, demand and supply patterns and source, direction and degree of competition.

Research and product development:

In 1979 MPEDA, established a research and product development division to generate ideas that bring about changes in the existing range of seafood products and marketing.

- A major break through in product development came with the introduction of raw and cooked head-on-shrimp as a new product from India for the international market.
- Several new products having good marketing prospects have been identified and the necessary technology has been developed in India for processing them.
- MPEDA has organized test marketing of canned sardine in Singapore.
- MPEDA has prepared comprehensive products profile on canned sardine, mackerel and tuna, which have excellent export potential.
- Plans are afoot to offer technical and financial assistance to entrepreneurs for the development and marketing of new products.

Development:

If the pace of modernization is to be accelerated, if the level of production, is to be held at a high level, if quality standard are to be meticulously adhered to, one thing is imperative-external assistance by way of developmental projects. MPEDA has taken

the initiative to plan and execute several such development schemes:

- **Insulated fish boxes**: Most of the small-mechanized fishing boats now do not have built-in-fish holds for preserving the catch on board. The result has been spoilage before the catch land ashore. To solve this problem, MPEDA has been operating a scheme since 1977, under which specially designed insulated fish boxes are supplied to registered boat owners at a subsidy of 50%.
- Landing platforms: MPEDA offers financial assistance to the maritime state governments for the construction of modern landing platforms at selected centers.
- Subsidies: To ensure proper control at the pre-processing stage, registration of peeling sheds has been made compulsory and certain minimum requirements have been laid down. For this MPEDA offers subsidy of 20% per unit for upgrading the standards to acceptable levels.
- Mini laboratories: To bring the quality of Indian seafoods to international levels, MPEDA has introduced several schemes, one of which is for establishment of mini laboratories in processing plants.
- Development funds: MPEDA proposes to create two development funds to offer financial assistance to the industry- one for promoting diversified fishing and the other for modernizing fish processing and encouraging product diversification.

Prawn farming:

- MPEDA lays emphasis on the culture of shrimps and prawns. To achieve these two regional offices, at Bhubaneshwar and Cochin has been specially assigned to promote the cultivation and production of prawn.
- MPEDA undertakes feasibility studies and prepares project reports on prawn farming to help entrepreneurs in obtaining finances from banks.
- MPEDA offers technical assistance to the farmers in the design and construction of brackish water ponds.

Quality control:

- Processed sea foods awaiting exports have to comply with international quality standards. For this the quality control divisions in MPEDA ensure that the utmost hygiene is maintained at all levels of industry. MPEDA works in close co-operation with the Export Council of India and with other Indian and international quality control organisations to analyse potential hygiene problems and to update quality control techniques.
- Refrigerated trucks: 9 refrigerated trucks in maritime states are serviced to keep the cargo at a constant temperature of – 20-degree centigrade.
- Frozen storages: large frozen storages for cargo awaiting shipment.
- Inspection laboratory: MPEDA is constantly at work to popularise international quality control techniques in Indian seafood processing. The introduction of the wild mantrap flask for the filth determination as per United States Food and Drug Administration standards is an example.

- Pollution control: MPEDA regularly monitors and analyses the coastal waters for toxic metals like mercury, lead, arsenic, etc and screens the products themselves for incidence of these toxic elements.
- Extension services: To motivate the industry personnel at all levels to concern themselves with hygiene and sanitation, MPEDA quality supervisors go to the field and demonstrate to the fishermen and processing plant workers, the importance and methods of maintaining high standards of quality and new techniques of handling and processing seafood.
- Training: MPEDA regularly imparts training to peeling shed workers, processing plant operations and laboratory technicians and other industry personnel.

Publicity and public relations:

The External market has to be kept constantly informed of the Indian seafood industry; its case has to be well presented, its image kept at a high level.

This is necessary :

- To stem competition,
- To increase demand for the existing products and ensure repeated purchases.
- To create demand for new products
- To create and enhance customer confidence and build mutual goodwill, to erase any stigma that the Indian Products may have had in the past.

MPEDA Publications:

"Directory of exporters of Marine Products from India"

"INDIAN SEAFOODS"- magazine

"INDIAN FISHERY ATLAS"

"SEAFOOD NEWS LETTER"

MPEDA participates in major international trade fairs. At home, MPEDA periodically organises the Indian Seafood Trade Fairs.

MPEDA subsidy schemes for seafood processors

MPEDA subsidy schemes for aquaculture

Table 20.4 : MPEDA subsidy schemes for seafood processors

Sr. no.	Name of the scheme	Objective	Rate of assistance
1	Subsidy for automatic flake/ chip tube ice making machine.	To assist seafood processors to install machines for production of quality ice required for in-plant use.	25% of the cost of the machine subject to a maximum of Rs 2.00 lakh.
2	Subsidy for generator sets	To assist the seafood processing units to have a capacity power as a stand by.	25% of the cost of generator set or Rs 2.50 lakh whichever is less.
3	Subsidy for upgrading deficient cold storage.	To enable seafood processors to upgrade their storage so as to maintain optimum temperature.	25%for improving insulation and 255for upgrading the existing diffusers, subject to a maximum of Rs. 3.5 lakhs.
4	Subsidy for acquisition of all processing machinery and equipments for production of value added marine products.	To assist seafood processors to acquire machinery and equipments for production of value added marine products	25%of the cost of machinery and equipment, subject to maximum of Rs 15.00 lakhs.
5	Subsidized distribution of insulated fish boxes.	For proper preservation of raw materials in iced condition on board fishing vessel, in shrimp farms, peeling sheds and processing plants.	Moulded synthetic insulated fish boxes of various capacity are distributed at 50% subsidy/ maximum limit
6	Interest subsidy assistance for seafood units to facilitate up gradation.	To subsidize a part of the interest payable by the plant owners to their bank/ financial institutions for the loans availed by them for modernization of their plant to achieve conformity to EU standards.	The subsidy eligibility will be restricted to a maximum of 7% of the interested charged by the bank/ financial institutions over and above the international interest 7% or actual rate of interest over and above the international interest i.e. 7% whichever is less.
7	Assistance for establishment of chill room facility in seafood processing plants.	To assist seafood processors to set up chill room facilities in their processing plants for preserving the quality of the raw material at proper temperature starting from harvest till processing.	25% of the cost of establishment of chill room facility subject to a maximum of rs3.00 lakh per chills room and the assistance would be available for a maximum of 2 chill rooms in a processing unit.

8	Assistance for installation of Water Purification System in seafood processing plants.	To assist seafood processors to establish suitable Water Purification Systems in their processing plants for achieving equivalency to EU norms with regard to water quality.	25% of the cost of installation of Water purification System subject to a maximum of Rs 2.50 lakh per unit.
9	Assistance for setting up of Effluent Treatment plants in seafood processing plants.	To encourage seafood processors to provide effective Effluent Treatment Plant in their processing units for achieving equivalency to EU norms.	25% of the cost of setting up of Effluent Treatment Plant subject to a maximum of Rs. 7.00 lakh per unit.
10	Financial support for acquisition of refrigerated truck/ containers.	To encourage seafood processors to acquire Refrigerated trucks/ Containers for the transportation of raw material/ finished products.	25% of the cost of refrigerated truck/Container subject to a maximum of Rs 3.5 lakh.
11	Subsidy for setting up Mini Laboratory	For effective implementation of in process quality control.	50% of the cost of mini laboratory to a maximum of Rs 0.5 lakh per unit.
12	Assistance to seafood processors to establish captive pre- processing plants with upgraded facilities.	To bring the per- processing activities under the control of processors and upgrade the facilities on par with HACCP/ EU regulations.	50% subject to a maximum of Rs 15 lakhs for new construction of pre- processing plants, which is also linked with the capacity of workers that can be employed. In the case of renovation, the subsidy is 90% of the cost of new construction i.e. subsidy on par with new units subject to reduction of a flat 10%.

Table 20.5 : MPEDA subsidy schemes for aquaculture

Sr. no.	Name of the scheme	Objectives	Quantum of subsidy
A	Subsidy for new farm development	For development of new prawns\ shrimps farms.	@ 25% of the capital cost subject to a maximum of Rs 30,000 per hectare water area restricted to Rs 1.5 lakh per beneficiary.
B	Subsidy for small scale hatcheries	For setting up shrimp hatchery with a minimum production capacity of 10 million seeds per annum.	Subsidy @ 15% of the capital cost or Rs 1.5 lakh for the private hatcheries, 25% or Rs 2.5 lakh toco-operative sector and Rs 5.00 lakh for Govt sector.
C	Subsidy for medium scale hatcheries	For setting up of shrimp hatchery with a minimum production capacity of 30 million seeds per annum.	Subsidy @25%of the capital cost subject to Rs 5.00 lakh per beneficiary/ hatchery
D	Subsidy for setting up PCR labs in hatchery	To establish PCR in hatcheries. To set up effluent treatment system attached to shrimp farms.	Subsidy @50of the capital cost subject to Rs 5.00 lakh per beneficiary/ hatchery.
E	Subsidy for effluent treatment system	To set up effluent treatment system attached to shrimp farms.	Subsidy @25%of the capital cost, subject to Rs 1.5 lakh for shrimp farms with minimum water of 5.00 hectare and up to Rs 6.00 lakh per beneficiary.
F	Subsidy for establishment of chill room facilities in shrimp/ prawn farming areas.	To set up facilities for post harvest care of farm raised shrimp.	Subsidy @25% of the cost of establishment of chill room, subject to a maximum of Rs 3.00 lakh per beneficiary.

Export inspection council

Seafood quality in India made its beginning in 1965, when frozen and canned shrimps were brought under the preview of the Compulsory Quality Control and Pre-shipment Scheme Act, 1963. This act, which came into force with effect from first January 1964, is the central legislation that gives powers to the Government of India to frame the policies and programmes for effective implementation of quality control and quality assurance measures in respect of export commodities. The Act provided for the establishment of the Export Inspection council and Export Inspection Agencies (EIAs) for operating and monitoring the various quality assurance schemes.

The Export Inspection Council, which was set up in 1964, under the Export (Quality Control and Inspection) Act 1963, the apex body in the country to advise the Central Government on matters relating to measures for the enforcement of compulsory quality control and pre- shipment inspection of commodities intended for export.

The Government of India has established five Export Inspection agencies (EIAs), one each at Mumbai, Calcutta, Cochin, Delhi and Chennai, for carrying out the functions connected with the quality control and inspection of export commodities. The field officers of the EIAs are strategically located in all port towns and seafood production centres to provide prompt and effective services to the export industry.

Notified items of seafood were subject to mandatory export quality control in the form of end product sampling and testing during the period from 1965to 1967. Realizing that mere end product inspection does not guarantee seafood safety, fish and fishery products were brought under the In- process Quality Control (IPQC) system with effect from 31 December 1977. Under the IPQC system, a processor intending to export seafood are required to meet the specified requirements in respect of pre- processing and processing facilities, personnel sanitation and hygiene, in- process controls, pre- processing and pro- processing practices and end product standards.

Seafood processing for Export could be done only in units approved by the EIAs. The primary responsibility to ensure that fishery products conformed to the mandatory requirements was vested with the processors themselves and the role of the EIAs was to ensure, by periodical monitoring of the units, that the standards prescribed were properly maintained by the processors and to issue certificates of inspection for the export.

Traditional quality control and inspection systems relied on sampling and testing of the end product. These systems could not give adequate assurance to the importing countries as far as food safety was concerned. Major importing countries such as EEC, USA and Canada developed quality assurance programmes based on the HACCP (Hazard Analysis Critical Control Point) concept which is currently considered to be a system of choice for enhancing food safety.

Salient features of harmonized quality assurance and monitoring system (QAMS):

1. Processing of fishery products for export is permitted only in establishment or factory vessels approved by the Export Inspection Council.
2. The approved units are required to be regularly monitored by the Export Inspection Agencies to ensure they comply with the requirements.
3. Each approved processing unit is allotted number, which is required to be marked on the export package for identification.
4. The EIC, the competent authority, is totally independent of private sector and/ or seafood export trade in respect of the decision- making process concerning approval and subsequent monitoring of the units which are processing fishery products for EU, as both the Inter- Departmental Panel (IDP) and the Supervisory Audit Team (SAT) comprise representatives drawn from Government authorities, namely EIAs, MPEDA and CIFT.
5. SAT supervises the actions of the EIAs in order to verify that the monitoring system is effective and implemented uniformly throughout India.
6. Major deficiencies observed during the monitoring visit of the inspection staff of EIAs or the supervisory visit of the SAT are reported to the competent authority immediately. The competent authority in turn, advises the processing establishment to suspend its production and to take remedial steps to rectify the observed deficiencies, within a stipulated time frame.

System of inspection :

Three systems of inspection are in operation at present :

1. **Consignment- wise Inspection (CWI):** Under this system each export consignment of a notified commodity is inspected and tested by the recognised inspection agencies drawing on the basis of statistical sampling plan to check conformity of the products with the prescribed standards.
2. **In-Process Quality Control (IPQC):** The IPQC system lays emphasis on the responsibility of the manufacturers and processors in ensuring consistent quality of the product during each stage of production by exercising various levels of controls, namely, ram materials and bought- out components control, process control, product control, meteorological control and packaging control. The certificates of inspection in favour of the products for which a unit has been approved under the scheme are issued either by the EIA or by the unit itself.
3. **Self-certification(SC):** Under the Self-certification system, the manufacturing units fulfilling the stringent norms prescribed for the design and development raw materials, and bought- out components, process control, product control, meteorological control, packaging, after sales service, quality audit, house keeping and maintenance etc

are authorized by the Central Government to issue certificates of inspection for their own products themselves. There are 3 units approved under self- certification as on 31. 3. 2001

So far 59 seafood-processing units and seven freezer vessels have been approved to export their products to the countries of the EU. These establishments are being assessed by the EIAs as an on- going process through IDP and SAT. The units which quality for approval is added to the previous list of approved establishments and the fresh list is forwarded to the EU periodically. As the EC is satisfied about the capability of the competent authority in India, the updated lists of the approved establishments furnished to it from time to time by the competent authority is acceptable to the EU.

Constraints in the export promotion of value added products :

- Too many players in the export trade.
- Cut throat competition for the raw material.
- Lack of supply of quality raw material.
- Lack of marketing tie up (Co- packing, joint ventures etc).
- Need for additional investment on machinery, equipment etc.
- Lack of market and product information.
- Fear of heavy financial loss due to rejection.
- Non- availability of ingredients, suitable packing materials etc within the country.
- Higher cost of production and low margin of profit.
- Lack of trained workers
- Lack of research and development.
- Poor image of Indian seafood in some importing countries.

Suggested strategies for export promotion:

- Infrastructure improvement to ensure supply of quality raw material from marine capture fishery.
- Industry and farmer co- operation for supply of quality cultured shrimp.
- Incentives for encouraging industry for increasing production and market penetration.
- Special efforts for utilizing bulk of cultured tiger for value addition.
- Institutional funds at international interest rates and easy terms for setting up facilities.
- Training of work force.
- Image building for Indian seafood.
- Seeking help from international agencies for sustainable development.

Exim policy :

Before going into the details of the Exim policy, let us first understand some specific definitions:

Exim policy : Refers to the Export and Import (EXIM) Policy, as amended from time to time. The present policy has a 5-year framework (1997- 2002), which is co-terminus with the Ninth Five Year Plan. Within this 5-year policy framework, the exim policy as amended up to April1 is announced every year. The Exim Policy takes effect from April1. This is the last year of the 5-year exim policy 1997- 2002.

DGFT : Directorate general of Foreign Trade, which is headed by the Director General of Foreign Trade. The office of the DGFT is responsible for formulating and execution of Exim policy, including licensing.

EPZs/ EOUs: EPZ means export Processing Zones, which are special enclaves, separated from the Domestic Tariff Area (DTA) to provide an internationally competitive duty- free environment for export production. EOU means Export Oriented Units. The EOU scheme is complementary to the EPZ scheme, which is set up at specific locations. The seven EPZs in the country at Kandla, Santa Cruz, Falta, Noida, Cochin, Chennai and Vishakapatnam.

Capital goods: Capital goods means any plant, machinery, equipment or accessories required for the manufacture or production, either directly or in directly of goods or for rendering services, including those required for replacement, modernization, technological up gradation or expansion. Capital goods also include packaging machinery and equipment; refractory for initial lining, refrigeration equipment, power generating sets, machine tools etc. Capital goods may be for use in manufacturing, mining, agriculture, aquaculture, animal husbandry, floriculture, horticulture, pisciculture, poultry, sericulture and viticulture as well as for use in the services sector.

Component: Component means one of the parts of a sub- assembly or assembly of which a manufactured product is made ups and into which it may be resolved. A component includes an accessory or attachment to the component.

Consumables: Consumables means any item, which participates in or is required for a manufacturing process, but does not form a part of the end product. Items, which are substantially or totally consumed during a manufacturing process, will be deemed to be consumable.

Consumer goods: Consumer goods means consumption goods, which can directly satisfy human needs without further processing and includes consumer durables and accessories thereof.

Countertrade: Counter trade means any arrangement under which exports/ imports from/ to India are balanced either by direct imports/ exports from the importing/

exporting country or through a third country under a Trade Agreement or otherwise.

Excisable goods: Excisable Goods means any goods produced or manufactured in India and subject to a duty of excise under the Central Excise and Salt Act 1944 (1 of 1944).

Exporter: Exporter means a person who exports or intends to export and holds an Importer- Exporter code number unless otherwise specifically exempted.

Export obligation: Export obligation means the obligation to export the products covered by the license or permission in terms of quantity, value or both, as may be prescribed or specified by the licensing or competent authority.

Highlights of exim policy 2001- 2002

The honorable Minister of Commerce and Industry has announced on 31- 3 –2001 the amended/ revised Exim policy for the period 2001- 2002. The policy came into force with effect from 1-4-2001 and the same will be co- terminus with the Ninth Five Year Plan (1997- 2002).

- Quantitative restrictions (QRs) totally dismantled from april 1.
- Standing Group to be set up for monitoring import of 300 sensitive items.
- Policy focuses on accelerating export growth to achieve 1% global trade by 2004-2005.
- Export growth target at 18% for 2001-2002.
- Exim Policy schemes like duty exemption scheme and export promotion capital goods (EPCG) to be applicable to agro sector.
- Promotion of agricultural exports through agri- economic zones and agricultural export policy.

CHAPTER XXI
LINEAR PROGRAMMING

Introduction

Linear programming is a qualitative procedure by which limited resources such as capital, raw material, manpower etc. can be allocated, selected, scheduled or evaluated to achieve an optimal solution to a particular objective. The objective may be to minimize cost or maximize profit. LP has proven to be one of the most effective tools of operation research since its introduction in the late nineteen forties. Its popularity can be judged from the fact that it is applied successfully in diverse field such as military, industry, agriculture, and transportation and even in social sciences. Availability of computer software for solving very large LP problems of late has also enhanced its widespread use.

Linear programming or activity analysis is a mathematical technique for the analysis of optimum decision, subject to the certain constraints in the form of linear inequalities.

Application

(i) Maximisation of income

(ii) Minimisation of cost

Linear programming is a method to decide the optimum combination of factors to produce a given output or the optimum combination of products to be produced by given plan and equipment.

Basic Assumptions in Linear Programming

(i) Linearity Certainty

(ii) Divisibility

(iii) Additivity

(iv) Finiteness

(v) Single value expectation

1. **Linearity-** the assumption of linearity means that a part of production function included in the production process or activity must be linear i.e. each additional unit of input brings about a proportionate increase in input.

2. **Divisibility-**The assumption of divisibility implies that the factors of production and products can be divided into fractional units, eg, 1.5 ha, 2.2 quintals, 2 labours.

3. **Additivity-**The assumption of additivity implies that the activities or process must be additive. When two or more activities are used, their total product must be the sum of their original products. Hence it rules out the possibility of any interaction in input co-efficient per unit of the yield.

4. **Finiteness-** It is assumed that there is a limit to the number of alternative activities and resource restriction that need to be considered. If there is no limit the consideration of alternative activities and resource restrictions, the application of LP will lead us no where.

5. **Single Value Expectation-** this assumption implies that all input-output coefficient and prices are known with certainty. In the absence of this information, LP is futile.

Components of LP problems

There are three quantitative components in LP model.

1. An objective function
2. Resource requirement
3. Resource availability

The LP models provides prudent solutions, particularly to problems of farm financial management at micro level such as how much capital should be allocated to what enterprise. Its application at macro level for solving the problem of marketing and spatial allocation is also important. As a normative model (this tool indicates 'what should be') it always aims at combining the efficient enterprise giving weightage to constraints and profit maximization.

Algebraically it is stated in compact form as

Maximise $\delta = C' X$

Subject to

$$AX; B,X \geq 0$$

Where,

A is an	m x n	matrix of technical coefficients
C is an	n x 1	vector of prices or other weights of the objective function
X is an	n x 1	vector of activities (fish crops to be produced which are unknown decision variable)
B is an	m x 1	vector of resources or other constraints, availabilities in physical units, such as labour, credit, land etc., and
$C' X = \delta$,		the objective function

In expanded form it is written as

Objective function

$$\text{Maximize} \quad \delta = c_1x_1 + c_2x_2 + \cdots\cdots\cdots + c_nx_n$$

Constraints

Subject to $a_{11}x_1+a_{12}x_2+\text{———}+a_{1n}x_n \pounds b_1$

$a_{21}x_1+a_{22}x_2+\text{———}+a_{2n}xn \pounds b_2$

$a_{m1}x_1+a_{m2}x_2+\text{———}+a_{mn}x_n \pounds b_n$

and x_j (column 1 to n) all should be specified in positive values starting from zero or any positive value ($Xj \geq 0$) a_{ij} = i^{th} resource required to produce one unit of j^{th} crop aquaculture activity.

With S notation it is written as

Maximize $\delta = \sum_{j=1}^{n} C_j X_j$

Subject to $\sum_{j=1}^{n} C_j X_j \pounds Bi$

$X j \geq 0$

Bi = i^{th} resource available with farm for use in the production of crops

i ranging from 1 to m denoting the number of rows (constraints) in the problem.

j ranging from 1 to n indicating number of columns (crop production and aquaculture activities) in the problem.

Basic concept in LP

1. Activity in process -

The term activity is used to refer to crop and aqua cultural enterprises being undertaken. A typical method of production with specific resource requirement in aquaculture is referred to as a process or activity. Based on this concept, culture activities are delineated into separate or individual activities in the model, for example, a particular fish crop requiring different levels of inputs for obtaining various level s of output are treated as separate activities. Similarly if same species of a fish reared on different feeds, they can be taken as separate activities in the model. A process concept is based on input-output coefficient, to put it in another way, "a process is a method of converting a resource into a product with specified input-output relationship".

Types of activities: (a) Real activities (b) Intermediate activities (c) Disposal activities

(d) Artificial activities

Real activities include both purchasing and producing activities. Purchasing activities means the inputs like fertilizers and pesticides that are purchased from the market and used in the production process. The outputs that are produced in the process are called producing activities like fish crop. Intermediate activities are those, which are produced at the farm but not sold in the market. Disposal activities are included in the model in solving the problems to allow non-use of resources. Artificial activities also facilitate the obtaining of solutions of the LP model.

2. Decision variable

These are also called real activities that are specified in the objective function of the LP problem. Their magnitude in the optimal solution affect the decision of the manager, and are hence are called decision variables. Suppose the optimal solution obtained from LP problem is quite different from the actual practice of the farm, particularly in respect of water spread area and stocking area, then the decisions of manager are to be altered according to the solution in order to get maximum profit.

In addition to the production activities, activities such as buying and selling of inputs and products are also considered in the objective function of the model.

3. Product prices and input prices

Prices for products are to be ascertained with certainty. Too high or too low prices for products will distort the income estimates or net prices, often leading to results of unrealistic magnitude. In general, the average prices, pooled over three to five years are considered for LP model.

4. Restraints

These are also called limitations; constraints, etc. land, labour and capital are generally considered as constraints. In general macro level studies will have more constraints than micro level studies. If any resource is unlimited then there is no need for such resource to be considered as constraints.

All constraints can be specified in the model in three types.

i. Greater than equal to constraints (³)

ii. Less than equal to constraints (£)

iii. Equal to or equality constraints (=)

The equality constraints are called balance rows.

Goals of the programming model : Programming model guides the fish farmer to specify the farm plans which will give him maximum income under the given constraints, prices, yields and resource requirements.

Cost minimization in artificial feeding problems water exchange and seed transportation is considered in the objective function of LP model.

The Linear Programming Problem

(i) Decision variables

(ii) Objective function

(iii) Constraints

Decision variable - Important inputs

Objective function - Contribution of each input for a particular level of Output.

Constraints - With reference to the various decision variables

Example :

I. Maximise the following using graphical method:

$Z = 2x + 3y$

Subject to $3x + 2y \leq 6$

$x + y \geq 2$

$x, y \geq 0$

Solution :

The constraints are converted to equalities and by taking the value of one variable as zero. The other variable is calculated.

$3x + 2y = 6$ (constraint 1)

When $x = 0$ $y = 3$ (0, 3)

When $y = 0$ $x = 2$ (2, 0)

$x + y = 2$ (constraint 2)

When $x = 0$ $y = 2$ (0, 2)

When $y = 0$ $x = 2$ (2, 0)

Feasible solution and objective function value.

$z = 2x + 3y$

Plot these ordinates on the graph as A, B, C.

For A (0, 3) $\longrightarrow$ $z = (2 \times 0) + (3 \times 3) = 9$ (optimum solution)

B (0, 2) $\longrightarrow$ $z = (2 \times 0) + (3 \times 2) = 6$

C (2, 0) $\longrightarrow$ $z = (2 \times 2) + (3 \times 0) = 4$

II. Minimize

$Z = 45x + 55y$

Subject to

$6x + 4y \geq 120$

$3x + 10y \geq 180$

$X, y \geq 0$

Solution:

*Constraint (1) $6x + 4y = 120$

$X = 0 \quad y = 30 \quad (0, 30)$

$y = 0 \quad x = 20 \quad (20, 0)$

*Constraint (2) $3x + 10y = 180$

$X = 0 \quad y = 18 \quad (0, 18)$

$Y = 0 \quad x = 60 \quad (60, 0)$

Feasible region and z value

$Z = 45x + 55y$

In figure, quadrilateral ABCD is feasible region.

For A (0, 18) $\longrightarrow$ $z = (45 \times 0) + (55 \times 18) = 990$

C (20, 0) $\longrightarrow$ $z = (45 \times 20) + (55 \times 0) = 900$

D (10,15) $\longrightarrow$ $z = (45 \times 10) + (55 \times 15) = 1275$

Optimum solution

Example :

I. Maximise the following using graphical method:

$Z = 2x + 3y$

Subject to $3x + 2y \geq 6$

$x + y \geq 2$

$x, y \geq 0$

Simplex method is an algebraic iterative procedure used for linear programming problems that have numerous constraints and activities, which cannot be solved graphically. It is an algebraic iterative procedure, which by moving step by step from a given set of plan to an optimal solution.

Step - I

(i) Converting the inequalities in the equations into equalities with the introduction of slack variables or surplus variable (disposal activities).

(ii) The number of disposal activities to be introduced should be equal to the number of constraints or restrictions.

(iii) Construct simplex table using input-output coefficients.

Example :

Maximise $z = 400x_1 + 800x_2$ - (1)

Subject to $1x_1 + 1x_2 < 5$ - (2)

$30x_1 + 60x2 < 240$ - (3)

$100x_1 + 300x_2 < 900$ - (4)

$x_1, x_2 > 0$ - (5)

By adding the disposal activities.

Max. $z = 400\ x_1 + 800\ x_2$

Subject to $1x_1 + 1x_2 + 1x_3 = 5$

$30x_1 + 60x2 + 1x_4 = 240$

$100x_1 + 300x_2 + 1x_5 = 900$

$x_1, x_2, x_3, x_4, x_5 > 0$

x_3, x_4, x_5 ⟶ slack or disposal variable.

Simplex Table

Cj / Z	Resources	Available	Real activities		Disposal activities		
	Objective functions		400 / x_1	800 / x_2	0 / x_3	0 / x_4	0 / x_5
	X_3	5	1	1	1	0	0
	X_4	240	30	60	0	1	0
	X_5	900	100	300	0	0	1

Planning Stage I

Cs	Cj		400	800	0	0	0	
		X_0	X_1	X_2	X_3	X_4	X_5	X_o / X_i
0	X_3	5	1	1	1	0	0	5 / 1 = 5
0	X_4	240	30	60	0	1	0	240 / 6 = 4
¬ 0	X_5	900	100	300	0	0	1	900 / 300 = 3
	Z_j	0	0	0	0	0	0	
	Z_jC_j	0	- 400	- 800	0	0	0	

Planning Stage II

¬ 0	X_3	2	2 / 3	0	1	0	- 1/300	2 / 2 / 3 = 3
0	X_4	60	10	0	0	1	- 1/ 5	60 / 10 = 6
® 800	X_2	3	1 / 3	1	0	0	1 / 300	3 / 1 / 3 = 9
	Z_j	2400	800 / 3	800	0	0	8 / 3	
	$Z_j - C_j$	2400	- 400/3	0	0	0	8 / 3	

Planning Stage III

® 400	X_1	3	1	0	3/2	0	- 1 / 200
0	X_4	30	0	0	-15	1	- 3 / 200
800	X_2	2	0	1	-1 / 2	0	1 / 300
	Z_j	2800	400	800	200	0	2
	$Z_j - C_j$	2800	0	0	200	0	2

Note : Arrows indicate the outgoing and incoming activities respectively.

Max. $Z = 400x_1 + 800x_2 + 0x_3 + 0x_5$

$= 400(3) + 800(2) + 0 + 0(30.00)$

$= 2800$

With, $1x_1 + 1x_2 = 5$

$1(3) + 1(2) = 5$

Simplex method :

Simplex method : The linear programming problems, which have numerous constraints and activities. cannot be solved graphically. The best-known and most widely used method for solving the linear programming problems is the simplex method. The simplex method is an algebraic iterative procedure, which will solve exactly, and not approximately, any linear programming problem in a finite number of steps. It is a procedure for moving step by step from a given set of plan to an optimal solution.

Definitions

Objective Function

The function that is either being minimized or maximized. For example, it may represent the cost that you are trying to minimize.

Optimal Solution

A vector *x* which is both feasible (satisfying the constraints) and optimal (obtaining the largest or smallest objective value).

Constraints

A set of equalities and inequalities that the feasible solution must satisfy.

Feasible Solution

A solution vector, *x*, which satisfies the constraints.

Basic Solution

of (*Ax=b*) is a *basic solution* if the *n* components of *x* can be partitioned into *m* "basic" and *n-m* "non-basic" variables in such a way that:

- the *m* columns of *A* corresponding to the basic variables form a nonsingular basis and
- the value of each "non-basic" variable is 0.

The constraint matrix *A* has *m* rows (constraints) and *n* columns (variables).

Basis

The set of basic variables.

Basic Variables

A variable in the basic solution (value is not 0).

Nonbasic Variables

A variable not in the basic solution (value = 0).

Slack Variable

A variable added to the problem to eliminate less-than constraints.

Surplus Variable

A variable added to the problem to eliminate greater-than constraints.

Artificial Variable

A variable added to a linear program in phase 1 to aid finding a feasible solution.

Unbounded Solution

For some linear programs it is possible to make the objective arbitrarily small (without bound). Such an LP is said to have an unbounded solution.

Overview of the Simplex Method

The simplex method builds on Theorem 1 to identify the optimal solution to linear programming problems. Outlined below are the basic steps used in this iterative process.

Simplex Algorithm

1. Construct an initial solution. Put the linear program in standard form, determine an initial basic feasible solution, and fill out the tableau.
2. Identify the incoming nonbasic variable. Identify a nonbasic variable I_j which, if increased from zero, would improve the value of the solution. For such improvement $(C_j-Z_j)>0$, for maximization. This is the incoming variable in the pivot column, q, which will enter the basis. If no such variable is available, stop, the problem is optimal.
3. Identify the leaving basic variable. Use the ratio test to either (a) identify the leaving variable in the pivot row, p, to remove from the basis or (b) determine that the problem has an unbounded solution.
4. Perform a basis exchange. Pivot on the pivot element (p,q) to perform the basis exchange and update the tableau. Return to step 2.

Simplex Tableaus

The simplex method calculations can be organized in terms of a tableau, shown below.

Tableau 1			3	1	4	0	0
c_B	Basis	x_B	I_1	I_2	I_3	I_4	I_5
0	I_4	25	6	3	5	1	0
0	I_5	20	3	4	5	0	1
c_j - z_j		0	3	1	4	0	0

The elements of a tableau include the following.

1. Columns for each variable in the standard form problem.
2. Names for each problem variable.
3. Objective function coefficients (costs) for each variable.
4. An ordered list of basic variable names (members of x_B).
5. Current values for the basic variables.
6. Costs for each basic variable.
7. $-Z = -CX = -CB \times B$, the negative of the current objective function value *z*.
8. $C_j - Z_j$, the change in *z* for increasing the (nonbasic) variable from 0 to 1

(i.e, $\frac{\partial Z}{\partial X}$, I; î X *N)*. When maximizing, variables with $(C_j - Z_j) > 0$

can improve the solution.

9. $\tilde{A}_j$ the representation of A_j in terms of the current basis (defined in the next section).

Step 1. Construct an Initial Solution

The first step to to identify a starting basic feasible solution and the first tableau is initialized.

1.1 Fill in titles and objective function coefficients

across the top of the initial tableau.

Tableau 1			3	1	4	0	0
c_B	Basis	x_B	I_1	I_2	I_3	I_4	I_5
c_j - z_j							

1.2 Identify the initial basic feasible solution

as follows.

- Choose the easiest (since it is obviously basic and feasible).

$$B = (A_4, A_5) = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = I$$

a basic feasible solution.

Therefore

$$X_B = \begin{pmatrix} I_4 \\ I_5 \end{pmatrix}, \; X_N = \begin{pmatrix} I_1 \\ I_2 \\ I_3 \end{pmatrix}$$

- To get the solution values, we solve,

$$Bx_B = b$$

$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} I_4 \\ I_5 \end{pmatrix} = \begin{pmatrix} 25 \\ 20 \end{pmatrix}$$

so $I_4 = 25$, and $I_5 = 20$. Otherwise we compute the following ;

$$X_B = B^{-1} b = I^{-1} B = IB = b$$

giving

$$\begin{pmatrix} I_4 \\ I_5 \end{pmatrix} = \begin{pmatrix} 25 \\ 20 \end{pmatrix}$$

and again $I_4 = 25$, and $I_5 = 20$.

- Fill in the "^{C}B", "Basis", and "*B*" columns.

Tableau 1			3	1	4	0	0
c_B	Basis	x_B	I_1	I_2	I_3	I_4	I_5
0	I_4	25					
0	I_5	20					
$c_j - z_j$							

1.3 Compute the representation $\tilde{A}_j$

of each column vector A_j

- We saw that $A_j = B\tilde{A}_j$, therefore $B\text{-}1A_j = B\tilde{A}_j = \tilde{A}_j$
- For our basis B = I we get. $\tilde{A}_j = (I)\text{-}1\ A_j = IA_J = A_J$ So initially, the column representations are the same as the columns themselves.
- Fill in the column representations in the tableau by entering A-matrix coefficients.

Tableau 1			3	1	4	0	0
c_B	Basis	x_B	I_1	I_2	I_3	I_4	I_5
0	I_4	25	6	3	5	1	0
0	I_5	20	3	4	5	0	1
$c_j - z_j$							

1.4 Compute the $(c_j - z_j)$ marginal, or reduced, costs for each variable.

- Initially, $(c_j - z_j) = c_j$ if all slacks are used
- We can then fill Cinto the *c-z* row

Tableau 1			3	1	4	0	0
c_B	Basis	x_B	I_1	I_2	I_3	I_4	I_5
0	I_4	25	6	3	5	1	0
0	I_5	20	3	4	5	0	1
$c_j - z_j$			3	1	4	0	0

- In general,

$$Z_j = \sum_{i=1}^{m} CB\ ;\ \tilde{a}\ ;\ j,$$

or the cost of the solution variables representing I_j . Therefore we can view $(c_j - z_j)$ as follows.

$(c_j - z_j)$	is	the cost of variable I_j itself
	less	the cost of A_j in terms of the solution
	giving	the net change in problem cost if A_j is increased from 0 to 1, and the basic variables adjusted using $\tilde{A}_j$

1.5 Calculate and save -z.

Since $z - {}^{c}B \times B$, for our example $z = \$0 \cdot 25 + \$0 \cdot 20 = 0$. We store -z, completing the initial tableau.

Tableau 1			3	1	4	0	0
c_B	Basis	x_B	I_1	I_2	I_3	I_4	I_5
0	I_4	25	6	3	5	1	0
0	I_5	20	3	4	5	0	1
$c_j - z_j$		-0	3	1	4	0	0

Before leaving Step 1, it is informative to interpret $(c_j - z_j)$ in terms of our example. The initial solution has the following meaning with respect to the problem situation.

$$XB = \begin{pmatrix} I4 \\ I5 \end{pmatrix} = \begin{pmatrix} 25 \\ 20 \end{pmatrix} = \begin{pmatrix} \text{hours of slack in Dept P} \\ \text{hours of slack in Dept Q} \end{pmatrix}$$

Consider increasing nonbasic product 1 (I_1) from zero, by one unit. Since

$$\tilde{A}_1 = \begin{pmatrix} 6 \\ 3 \end{pmatrix}$$

then

$$1\ I1 \text{ is } \left\{ \begin{array}{c} \text{equivalent to} \\ \text{represented by} \end{array} \right\} \ 6\ I_4\text{'s and } 3\ I_5\text{'s in the current basis.}$$

To increase I^1 by 1, we'll have to take away

6 from IB_1 (I_4)

3 from IB_2 (I_5)

so that :

$$I_1\begin{pmatrix}6\\3\end{pmatrix} + I_2\begin{pmatrix}3\\4\end{pmatrix} + I_3\begin{pmatrix}5\\5\end{pmatrix} + I4\begin{pmatrix}1\\0\end{pmatrix} + I_5\begin{pmatrix}0\\1\end{pmatrix} = \begin{pmatrix}25\\20\end{pmatrix}$$

Before increasing I^1, we have :

$$0\begin{pmatrix}6\\3\end{pmatrix} + 0\begin{pmatrix}3\\4\end{pmatrix} + 0\begin{pmatrix}5\\5\end{pmatrix} + 25\begin{pmatrix}1\\0\end{pmatrix} + 20\begin{pmatrix}0\\1\end{pmatrix} = \begin{pmatrix}25\\20\end{pmatrix}$$

and after increasing I^1 from 0 to 1 and adjusting the basic variables to maintain feasibility we have :

$$1\begin{pmatrix}6\\3\end{pmatrix} + 0\begin{pmatrix}3\\4\end{pmatrix} + 0\begin{pmatrix}5\\5\end{pmatrix} + 19\begin{pmatrix}1\\0\end{pmatrix} + 17\begin{pmatrix}0\\1\end{pmatrix} = \begin{pmatrix}25\\20\end{pmatrix}$$

The net cost of this trade is $C_j - C_B \tilde{A}_j$ This can be summarized as :

- $I_j = 3$, the cost of increasing I_1 to 1,
- minus $Z_j = 0$, the cost of decreasing $x_B = 6\ (\$0) + 3(\$0)$
- yielding 3, the net change in the objective value, an improve

Step 2. Identify the Nonbasic Incoming Variable

Identify a nonbasic variable Ij as the entering variable such that (Cj - Zj) > 0 . If none exists, stop—the current solution is optimal.

- Any Ij such that (Cj - Zj) > 0 will do.
- Most positive rule: the nonbasic with the most positive Cj - Zj
- Other rules: the largest improvement in *z*, normalized, DEVEX, candidate lists.

The choice defines the pivot column, *q*. For our example, we will use the most positive rule which gives us column 3 with C3 - Z3 = -4 (indicated by *). Hence *q*=3 for our example's initial tableau.

Tableau 1			3	1	4	0	0
c_B	Basis	x_B	I_1	I_2	I_3	I_4	I_5
0	I_4	25	6	3	5	1	0
0	I_5	20	3	4	5	0	1
$c_j - z_j$		0	3	1	4*	0	0

Step 3. Identify the Leaving Basic Variable

This step uses the *ratio test* to select the leaving variable or determine unboundedness of the problem. In our example we have chosen I_3 as the entering variable for the current basic solution. The corresponding tableau column gives us the representation of I_3 as :

$$\tilde{A} = \begin{pmatrix} 5 \\ 5 \end{pmatrix}$$

Therefore, for every unit increase in I_3 we must adjust xB by $\tilde{A}_3$, so that the new solution becomes

$$x_B - I_3 \tilde{A}_3$$

or

$$\begin{pmatrix} 25 \\ 20 \end{pmatrix} - I_3 \begin{pmatrix} 5 \\ 5 \end{pmatrix}$$

Consider the elements of any $\tilde{A}q$.

If $\tilde{a}_{iq}$ is the corresponding variable I_{Bi}'s value

< 0	will increase
= 0	will be unchanged
> 0	will decrease

Hence we have the following results :

If $\tilde{A}q \leq 0$, then Iq can increase without limit and the problem is unbounded. This

is true for any column.

If any $^{Iiq > 0}$, increasing ^{Iq} will decrease a basic variable, $^{IB^i}$. If ^{Iq} becomes too large, ^{IBi} will become negative; in fact it becomes zero when ^{Iq} reaches (IBi / ã iq)

So to maintain feasibility (x ³ 0) we use the following ratio test to select the leaving variable.

Ratio test. Increase the incoming variable ^{Iq} by

$$q = \min_{\tilde{a}_{iq}>0} \left\{ \frac{IB_i}{\tilde{a}_{iq}} \right\}$$

at which point IBi (in tableau row *i*) becomes zero *first* (or ties). This row is called the pivot row *p*, and the corresponding IBp is the leaving variable.

Note that, since the reduced cost $C_j - Z_j$ gives the rate of change in *z* by increasing ^{I_q} and q is the amount of increase of ^{I_q}, the total change in *z* from this exchange of variables is $q\ (C_j - Z_j)$

For our example,

Tableau 1			3	1	4	0	0
c_B	Basis	x_B	I_1	I_2	I_3	I_4	I_5
0	I_4	25	6	3	5	1	0
0	I_5	20	3	4	5	0	1
$c_j - z_j$		0	3	1	4*	0	0

Row i	x_B variable	ratio $IB_i / \tilde{a}_{iq}$	
1	I_4	(25/5) = 5	
2	I_5	(20/5) = 4	¬ minimum ratio, pivot row p

Since the pivot row *p*=2, ^{I_5} becomes 0 and leaves the solution when ^{I_3} enters the solution at $^{q = 4}$. The The tableau element $^{\tilde{a}_{pq}}$ where the pivot row and pivot column intersect is called the pivot element, shown in parentheses below.

Tableau 1			3	1	4	0	0
c_B	Basis	x_B	I_1	I_2	I_3	I_4	I_5
0 I_4	25	6	3	5	1	0	
0 I_5	20	3	4	(5)	0	1	
c_j -	z_j	0	3	1	4*	0	0

Step 4. Perform a Basis Exchange

Execute a pivot to exchange variables and update the tableau. With a change in the basis, all the representations $\tilde{A}_j$ may change. Pivoting is a method of updating all of these tableau values.

4.1 Perform pivot.

Each element under the B and I_j columns can be updated with the following formulas, where $\tilde{a}\phi_{ij}$ is the updated value of $\tilde{a}_{ij}$.

$$\tilde{a}\phi_{ij} = \tilde{a}_{ij} - \left(\frac{\tilde{a}_{pi}}{\tilde{a}_{pq}}\right) \tilde{a}_{ij} \quad \text{"i } ^1 \text{ p}$$

$$\tilde{a}\phi_{pj} = \left(\frac{\tilde{a}_{pi}}{\tilde{a}_{pq}}\right) \tilde{a}_{ij}$$

The update is summarized in the following steps.

Pivot operation.

1. Divide row *p* by the pivot element, $\tilde{a}_{pq}$, yielding a 1 at $\tilde{a}\phi_{pq}$

2. For every other row *i*, subtract the revised row *p* multiplied by $\tilde{a}\phi_{iq}$. This will give a 0 in the pivot column.

Note that the solution column and $Cj \text{ ¾ } Zj$ row is updated as well.

4.2 Update stub information in row *p*.

4.3 Return to Step 2.

For our example, we begin a second tableau, initially copying the headings, then the individual rows as they are updated.

1. First update the pivot row.

Tableau 2			3	1	4	0	0
c_B	Basis	x_B	I_1	I_2	I_3	I_4	I_5
		4	3/5	4/5	(1)	0	1/5
c_j - z_j							

2. Then update the remaining rows, including Cj ¾ Zj.

Tableau 2			3	1	4	0	0
c_B	Basis	x_B	I_1	I_2	I_3	I_4	I_5
0	I_4	5	3	1	0	1	1
		4	3/5	4/5	1	0	1/5
c_j - z_j		16	3/5	-11/5	0	0	-4/5

3. Finally, update the stub in row *p* and complete the iteration.

Tableau 2			3	1	4	0	0
c_B	Basis	x_B	I_1	I_2	I_3	I_4	I_5
0	I_4	5	3	1	0	1	1
- 4	I_5	4	3/5	4/5	1	0	1/5
c_j - z_j		16	3/5	-11/5	0	0	-4/5

Let's verify two of the representations created after our example problem's first pivot.

$$b = 5\,A_4 + 4\,A_3 = 5\begin{pmatrix}1\\0\end{pmatrix} + 4\begin{pmatrix}5\\5\end{pmatrix} = \begin{pmatrix}5\\0\end{pmatrix} + \begin{pmatrix}20\\20\end{pmatrix} = \begin{pmatrix}25\\20\end{pmatrix}$$

$$A_1 = 3\,A_4 + (3/5)\,A_3 = 3\begin{pmatrix}1\\0\end{pmatrix} + \frac{3}{5}\begin{pmatrix}5\\5\end{pmatrix} = \begin{pmatrix}3\\0\end{pmatrix} + \begin{pmatrix}3\\3\end{pmatrix} = \begin{pmatrix}6\\3\end{pmatrix}$$

Also checking $C_1 - Z_1$

C1	=		=	3
Z1	=	CB Ã1 = 0 (3) + 4 (3/5)	=	(12/5)
$C_1 - Z_1$	=	3 (12/5)	=	- (3/5)

The objective function value *z* is also 0(5) - 4(4) = -16. This verifies the change in *z* computed to be $q\,(C_j - Z_j) = 4(-4) = -16$

CHAPTER XXII

FISHERIES SOCIO-ECONOMICS

Introduction

Socio-economics deals with the social and economic aspects of a community or society revealing the social structures, organizations, institutions and family stratifications. The important socioeconomic parameters includes food, clothing, sanitation, health, literacy, income, mode of sale of catch, credit indebtness etc. The social and economic factors are important to know the actual production relationship and the means of production.

Socio-economics aspects of fishermen

The socio-economic condition provides the background and basic information about the demographic, social and economic conditions of the sampled fishermen. This information is given on variables such as family size, number of earners, educational status, employment in fishing and fishing related activities, ownership of fishing and non fishing assets, caste, status, family expenditure, housing, sanitation and drinking water facilities.

To understand easily about the socio-economic conditions of a sampled fisherman, a survey is needed. According to a survey conducted at Vishakhapatnam (Vishakhapatnam District), Kakinada (East Godavari District) and Nizampatnam (Guntur District) areas of the state of Andhra Pradesh in the year 1997-98:-

The family size of the traditional craft operators were 5.91,

Mechanized craft operators were 4.29 on the average.

The number of earners were 3 and 2.5 in the above two groups.

Majority of the fishermen under the two craft groups, 46% of the sample is illiterate and 28% of traditional craft owners were having only elementary education, whereas 3% of mechanized group had education of high school and above levels.

The entire sample under traditional craft operators belonged to fishermen caste. In the mechanized group 72% were from fishermen caste and 28% from non-fishermen caste groups. Majority of the traditional craft operators self owned the craft (60%) and remaining 40% owned with other fishermen of same village. Whether the crafts are self owned or owned with others, all the crewmembers amongst the owner operators receive equal share in the catch, leaving one share to the boat and gear towards depreciation under the sharing system of the catch. In contrast to the above 71% of the mechanized craft operators owned the fishing assets with others and only 29% had self owned fishing assets.

The fishermen of traditional craft operated for 4 months in the sea and 6 months in the estuarine canals. Thus they found employment for 300 days in a year in fishing

activities. In the mechanized sector on the average the fishermen went for 174 days of fishing and remaining days engaged in repairing of nets and crafts and drying of fish etc. for about 104 days. Thus they found employment for 278 days in fishing and fish related activities. The family expenditure per annum for fishermen was Rs.11553 and Rs.12923 for traditional craft owners and mechanized craft owner. Almost 97% of the traditional fishermen lived in semi permanent structure with mud walls and thatched roofs and such type of living was the extent of 77% of the mechanized craft fishermen in the sample. None of the sample had sanitation facilities and protected drinking water facilities the hygienic conditions in and around the fishermen houses and villages were far below the normal standards of living.

Fixed capital investment pattern

The total fixed capital investment by the fishermen or traditional crafts was Rs.13000 (Rs.6375 for craft and Rs.5945 for gear).

Traditional craft motorized with 10-20HP engine boarded openly on the bout out board motor (OBM).

The fixed capital investment was Rs.89941 out of which craft and gears shared each 38%.

In mechanized inboard type craft the total capital investment was

Rs.1, 58,833 for 68 HP

Rs.1, 80,700 for 98 HP

Rs.2, 61,615 for 108 HP

Socio-economic study

One of the most important sources of micro data for aquaculture economic studies is the socio-economic survey.

Basic premise is that the data furnished by the respondents is an honest effort to answer the questions that are asked in a personal interview or a mail questionnaire. Because the survey provides an extremely important information about current status problems, and constraints on aquaculture development and policy making.

Most surveys followed fairly standard procedures

1. Defining the problems and objectives
2. Determining the sample plan
3. Developing a questionnaire
4. Gather the data
5. Analyse the data

Determining the objectives of survey

1. To examine the socio-economic status and practice of the aquaculture industry from the gathering through pond rearing, harvesting, processing and marketing.
2. To analyze the details of production costs and returns from different culture techniques and systems used on various farm sizes and in different locations.
3. To identify major factors affecting the productivity and profitability
4. To study the market potential and to examine the market structure and channel.
5. To identify the socio-economic constraints on development.

Probability sampling

It is known as random sampling or chance sampling, under this every item of the universe has an equal chance of inclusion in the sample. This random sampling ensures the law of statistical regularity which states that if on an average the sample chosen is a random one the sample will have the same composition and characters as the universe. This is the reason why random sampling is considered as the best technique of selecting a representative sample.

Preparing a questionnaire

The researcher must pay attention to the following points in constructing schedule.

1. Researcher must keep in view the problem he is to study; he must be clear about various aspects of his research problem to be dealt within the course of his research project.
2. Appropriate form of questions depends on the nature of information sought.
3. Rough draft of the questionnaire/schedule be prepared giving due thought to the appropriate sequence of putting questions.
4. Researcher must invariably re-examine and in case of need may revise the rough draft for a better one.
5. Pilot study should be undertaken for pre-testing the questionnaires.
6. Questionnaire must contain simple but straightforward directions.

Analysing data

By analysis we mean the computation of certain measures along with the searching for pattern of relationship that exist among the data groups.

Analysis of two types

1. Descriptive analysis
2. Inferential or statistical analysis

Descriptive analysis

It is largely to study the distributions of one variable. This study provides with profiles of companies work groups persons and other subjects on any of a multitude of characteristics such as size composition efficient, preferences etc.

Correlation analysis

It studies the joint variation of two or more variables to determine the correlation.

Casual analysis

Study of how one or more variables affects the changes in other variable.

In modern days multivariate analysis may be defined as all statistical methods, which simultaneously analyze more than two variables on a sample of observations.

Characteristics of a good sample design

1. Sample design must result in truly representative sample.
2. Must be such which results in a small sampling error.
3. Must be viable in the context of funds available for the research study.
4. Must be such so that systematic bias can be controlled in a better way.
5. Sample should be such that the result of the sample study can be applied in general, for the universe with a reasonable level of confidence.

Table : 22.1 showing basic sampling designs

Representation basis

Element section technique	Probability sampling	Non probability sampling Representations
Unrestricted sampling	Simple random sampling	Haphazard or convenience sampling
Restricted sampling	Complex random sampling (Such as cluster sampling, systematic sampling, stratified sampling etc.	Purposive sampling (Such as quota sampling, judgment sampling

Sample designs are basically of two types- Non-probability sampling and Probability sampling.

Non probability sampling

It is that which does not afford any basis for estimating the probability that each item in the population has of being included in the sample. It also called as deliberate sampling, purposive sampling and adjustment sampling.

In this type of sampling items for the sample are selected deliberately by the researcher. His choice concerning the items remains supreme or organizers of the inquiry purposively choose the particular units of the universe for constituting a sample on basis that the small mass that they select out of a huge on will be typical or representative of the whole. Thus the judgment of the organizers of the study plays an important part in this sampling design.

Sample questionnaire of socio economic survey

1. Beginning inventory

Species		"No" or kg	Unit price	Value
	Pry/fingering			
	Growers			
	Market size			

2. Cost of fry per crop

Species	Fry/fingerling purchased	Mortality rate from purchased to stocking	Stocked No.	No of crops per year

3. Sources of stocking material

Location	Pickup	Delivered	Distance travelled	

4. "No" of stocking per crop
5. Reason for stocking schedule

   To optimize the production

   Availability of fly for stocking

Survey schedule on the socio-economic status of fisher folk

Socio-economic Survey

(A)

(a) Name : _____

(b) Age : _____ Sex : _____

(c) Caste : _____

(d) House No. : _____ Ward No. : _____

(e) Address : _____

_____

_____

_____

PIN : | | | | | | |

Phone No.: _____

(f) Head of the Family : _____

Age : _____ Sex : _____

(g) No. of Family Members : _____

Adult : _____ Male : _____ Female : _____ Children : _____

(h) No. of Dependents : _____

(i) Sources of Income :

Fishing _____

Marketing _____

Bye-Products _____

Others _____ Specify _____

(j) Persons engaged in Fishing:

Male: _____ Female: _____ Total: _____

(k) Other Occupations:

(1) _____

(2) _____

(3) _____

(l) Fishing Boat, if any : Specifications of Boat (3)

(1) Owned: _____ (a) Motorised ☐

(2) Rented: _____ (b) Mechanised ☐

(3) Workers in other boats : ____ (c) Artisanal ☐

OAL in Metres (m) _____

(m) Fishing Gear Operated :

Trawl Purse Seine Gill Net

Dolnet Others

Specify

(n) Monthly income from Fisheries : Rs. _____ /-

Others : Rs. _____ /-

Total : Rs. _____ /-

(B)

(i) House Specifications:

Rented : Owned : Slum :

(a) Electrification :

Yes : ☐ No. : ☐

(b) Drinking Water :

Yes : ☐ No. : ☐

(c) Gas Connection :

Yes : ☐ No. : ☐

Other Facilities :

Yes : ☐ No. : ☐

(d) Assets :

TV : ☐ Radio : ☐ Fridge : ☐

Bike : ☐ Vehicles : ☐ Others : ☐

Specify : _____

_____

_____

(ii) Monthly Expenditure:

Food : ☐

Health : ☐

Education : ☐

Fishing : ☐

Others : ☐

(iii) Literacy in Family :

Illiterates : Literates :

L.P. _____

U.P. _____

H.S. _____

College _____

Professional _____

Others _____

(iv) Savings :

Monthly : _____ Institutional Personal

Rs. _____ Rs. _____

Annual : _____ Rs. _____ Rs. _____

(v) Loans :

Pending Amount : Rs. _____

Rs. _____

Rs. _____

Problems in Paying : _____

_____

(vi) Affiliations to Institutions :

Political : Yes ☐ No ☐

Social : Yes ☐ No ☐

Specify ; _____

Co-op Society : Yes ☐ No ☐

Specify : _____

(vii) Information known to them on Modern Technologies :

_____

_____

(viii) Other Information :

_____

_____

Place : _____ Name of Surveyor : _____

Date : _____ Signature : _____

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Sample Questionnaire of Socio-Economic Survey in Culture Fisheries :

Date of Enumeration _____

Enumerator _____

A. General Information:

(1) Name of respondent _____ Owner/Operator _____ Caretaker _____

(2) Address of respondent _____ Telephone _____

(3) Location of Pond _____

(4) Pond area :

Nursery pond (s) : Area (ha) _____ Depth _____ Number of ponds _____

Rearing pond (s) : Area (ha) _____ Depth _____ Number of ponds _____

Total area of fish farm (ha) _____

(5) Water Supply: Well _____ Tide _____ Other (specify) _____

(6) Pond Ownership :

	LEASED	
	From	From
	Private owner	Public sources
Area		
Annual rent		
Type of lease : Fixed cash Share of production Share of revenues and costs		
Length of lease (yrs)		
Lease renewable: Yes No		

(7) Experience: Years farm in operation _____

Years experience of operator _____

(B) Stocking / Pond No.:

(1) Beginning inventory

Species	No. or kg	Unit price	Value
	Fry/fingerling		
	Growers		
	Market size		

(2) Cost of fry per crop

Species	Fry/fingerlings purchased No.	Unit Price	Cost	Mortality rate from purchase to stocking Percent	No. stocked	No. of crops/yr

3) Source of stocking materials :

Location _____ Pick-up _____ Delivered _____

Distance traveled _____

(4) How is price of fry/fingerlings determined :

Prevailing price _____ bidding _____ delivered _____

Dictated by seller _____ other _____

(5) Number of stocking per crop _____

(6) Reason for stocking schedule:

To optimize production _____

Availability of fry for stocking _____

(C) Feed/Fertilizer/Pesticides/Pond No. :

(1)

	Kind	Crop	Kg/ha/ Cost/kg	Frequency of application
Feed				
Fertilizer				
Pesticides				
Supplementary feed				

(2) How knowledge of feeding/fertilization/pesticide technique acquired :

Experience _____ Extension agent _____ Reading _____ other _____

(3) Type of soil

(D) Labor / Pond No. :

(1) Labor (man/hour) required for crop.

	Family (M)/(F)/(C)	Caretaker (M) / (F)	Hired (M) / (F)	Other (M)/(F)
Pond preparation				
Stocking				
Feeding				
Fertilization				

Weeding

Repair and maintenance

Harvesting

Processing

Marketing

Other

(2) Payment

	Rate/man-day	Food	Share of crop	other
Caretaker				
Male				
Female				
Hired				
Male				
Female				
Other				

(3) Annual salaries and wages of management personnel.

	Annual (or monthly.) salaries	Fringe Benefits	Total
Manager			
Technician			

(E) Harvesting / Pond No.:

(1) Production/crop

Species (specify)	Sold Kg	Eaten Price/kg	Given away (kg)	Other (kg)

(2) Ending inventory

Species	No. or kg	Unit price	Value
Fry/fingerlings			
Growers		Market size	

(3) Mortality rate from stocking to harvesting (percent) _____

Possible causes of mortality :

Sudden change of weather _____ Water pollution _____

Lack of proper food _____ Overstocking _____ Disease _____

Flood _____ Other _____

(4) Number of harvests per crop _____

(5) Reason for harvesting schedule :

To optimize production _____ to get highest price _____

Availability of fry for restocking _____ Need for money _____

(6) Method of harvesting

Total drainage of pond _____ Using net _____ Other (specify)___

(F) Marketing:

(1) Channels and costs

	Marketing Cost / Crop			
	Ice	Containers	Trans-portation	Comm.	Waste
	(%)				
Direct sale					
Auction sale					
Cooperative sale					

(2) Method of payment

Cash _____

Credit _____ For how long? _____

No. of installments _____

(3) Sale to same buyers

Yes _____ most times _____ No._____

If yes or most times, state reason :

Settlement of credit: _____ providing other services _____

Proximity _____ Other (specify) _____

(G) Loans:

(1) Loans borrowed for initial capital expenses $ _____ equipment $ ____

For expansion $ _____ for purchase of fry $ _____ for repair $ _____

(2) Sources of loans

Purpose	Amount	Annual Interest	Maturity
Relatives			
Brokers			
Government			
Banks			
Other			

(3) What factors accounted for the choice of the particular source :

Accessibility _____ Simple procedures _____

Fast credit extension _____ Services offered _____

Only source available _____ other _____

(4) What problems do you encounter in borrowing:

Too much paper work _____ Delayed release of loan _____

High interest rate _____ Lack of collateral _____ other ___

(H) Other farm expenses for entire farm :

	Amount/crop	Annual expenses
Fuel and oil		
Electricity		

Water

Supplies

Insurance

Taxes

Others (specify)

(I) Inventory of Assets

	Acquisition Year	Unit cost	Economic life	value	Prevailing market culture %	Use for fish
(1) Pond						
Levees						
Sluice gates						
ater canals						
Pond excavation						
Well						
Other (specify)						
(2) Buildings						
Office						
Residence (on farm)						
Caretaker's house						
Storage						
Other (specify)						
(3) Transportation						
Motorboat						
Truck						
Other (specify)						
(4) Nets						
Gill						

Seine

Other (specify)

(5) Equipment

Pump

Generator

Feeding machine

Refrigerator

Feed mixture

Other (specify)

(J) Problems and Other Information:

(1) What problems are encountered in the Industry?

Unfavorable price structure _____

Lack of proper infrastructure _____

Unavailability of credit _____

Shortage of fry _____

High price of inputs such as feed _____ fertilizer _____ ice ___
fuel _____

Limited market _____

Lack of extension service _____

Lack of skilled workers _____

Other (specify) _____

(2) Can government help to improve the industry?

Yes _____ No _____

If yes, in what way _____

If no, why not _____

(3) Percentage of operator's income from fish culture _____

(4) Sources of other income (specify) _____

SAMPLE QUESTIONNAIRE FOR A CONSUMER SURVEY

Name of Respondent : _____ Date of Enumeration _____

Address of Respondent : _____ Enumerator _____

1. Number of people in family _____ Ages _____ _____ _____ _____ _____
2. Profession of the head of family _____ Level of education (yrs) _____
3. Number of working family members _____ Types of jobs _____
4. Monthly family income (range) _____
5. When did you last eat fish? _____ Type of fish _____ Amount (kg) ___
6. How often do you eat fish? _____
7. Have you tried the species (the species concerned)? Yes _____ No _____

   If no, ask why _____

   Too expensive _____

   Not available all the time _____

   Not familiar with the species _____

   Other (specify) _____

   If yes: When did you buy it last? _____ Amount bought (kg) _____

   In which form: (a) live, fresh, frozen, salted, dried, etc.

   (b) whole, gutted, filter, etc.

   Where did you buy? Supermarket, fish market, fish stalls, fish peddlers, etc.

   How often do you buy it? _____

   How does? It taste? Excellent _____ Good _____ Poor _____

   Do you intend to consume more of this species in the future? _____

   If no, ask why:

   Do not like taste _____ too expensive _____ too bony _____

   Not always available _____ Low quality _____ Others (specify) ___

   If yes, ask

The size of fish preferred

The form of fish preferred

How often do you intend to buy it?

Once per week, or more _____

Twice per month _____

Once per month _____ Less than once a month ____

Other species you prefer (in order of preference) _____

In your opinion what is the closest substitute to the species _____

_____

CHAPTER XXIII
STRATEGIES AND METHODS FOR PROMOTING FISHERIES DEVELOPMENT

Introduction

A fishery provide the fifth largest agricultural resource accounting for 7.5% global food production and is the chief source of food protein for common people besides providing economic livelihood for many. Since independence, India has gradually emerged as a major fish-producing nation in the world being second in total aquaculture production and third in the overall fish production. India with a coast line of over 8143 Kms and Exclusive Economic Zone of around 2.02 million sq. km. Central Marine Fisheries Research Institute 's potential yield estimate is 3.9 million tones from total EEZ of this 1.7 million tones is available from outer continental shelf while the inshore water are being exploited to their full capacity. India is also having vast and varied inland water resource. Both capture and culture fisheries, the potential yield for inland fisheries has been estimated to be 4.5 million tons.

At the present point in time, there is danger of decline in capture fishery production due to overexploitation and habitat degradation. Increased production is possible through aquaculture, which is the world's fastest growing food production sector. But as witnessed in India's shrimp aquaculture, unregulated growth, a disease out breaks and projected adverse environmental degradation has had an adverse impact. However the picture can be considerably improved, if a participatory management process of all stakeholders viz., fishing community, industry, consumers and government is effected which takes advantage of latest technological innovation and production is increased in a sustainable manner without any adverse socio-economic and environmental impact.

Since fisheries is a broad term, the methods and strategies for its development are discussed under six headings such as Resource management, Aquaculture, Environmental issues, Harvest and post-harvest technology, Human Resource Development and Socio-economic issues.

Resource Management

The marine fisheries in India have transformed its nature from subsistence level activity to the fishing for commerce towards the turn of 19th century. The commercial orientation was further strengthened during the 20th century. The most rapid development in the marine fisheries sector came during second half of the current century. These developments were mainly directed towards increasing fish production and foreign exchange earnings.

Our marine living resources are spread in the Indian Ocean, Arabian Sea and Bay of Bengal covering an area under EEZ. The Indian Ocean has total area of 51 million sq kms. After declaration of EEZ in 1997, the available for fishing is estimated as 2.02 million sq.kms. Comprising 0.86 million sq.km. On the West coast, 0.56 million sq. km. On East coast and 0.60 million sq.kms. Around Andaman and Nicobar Islands. The present scenario of marine fisheries in the Indian EEZ is that of mixed status with coastal fisheries nearing optimum level of development and deep-sea and oceanic fisheries receiving scant attention. The euphoria of acquiring the vast area on the seas around the peninsula and envisaged development through the exploitation of rich fish stocks within the Indian EEZ could bring in certain deep-sea fishing schemes but they had limited positive impact. Our future effort should be in the line of optimizing the use of potential resources by application of eco-friendly technologies, maximizing use of fish that is caught by these technologies for human consumption and minimizing post-harvest losses. Preservation of ecological balance through sustainable exploitation of resources and management measures aimed at continuance of stock potential to meet the nutritional demands of ever growing human population.

In the inland sector of India, problems of resource management are not the same as in all other developing countries. A good many problems of India are peculiar and many others are similar to other developing countries. Some of the common problems of developing countries are, dearth of natural resources and suitable technologies, population explosion, poverty, ignorance, orthodoxy, religious taboo etc. India is bestowed with vast and varied type of inland waters as well as indigenous fish fauna. We face problems of diversity of natural resources, topographical and agroclimatical differences, varying types of indigenous fish fauna, vagaries of nature etc. Management policies are needed to be formulated keeping in view their regional nature.

Recommendations

Marine Resources:

a) Estimation of exploited marine fisheries resources:

As the marine fisheries of India are supported by multispecies and harvested by multi gear all along the coast line during day and night almost the year round, a sound technique for collection of catch and effort data has to be employed for the entire coast.

b) Regulation of fishing effort:

Due to open access, Indian marine fisheries, of late, has slipped from labor-intensive artisanal fisheries to capital-intensive industrial fisheries. The major shift from artisanal fisheries due to rapid growth of mechanized fleet in recent years has increased the fishing pressure by overlapping of fishing activities of both the sectors on coastal resources.

It is a fact that many of the most valuable stocks of pelagic and demersal origin are nearing or have reached full exploitation levels. In most fisheries, over fishing signs like reduction in the average size of fish caught and declining catch per unit of effort have been observed. Intensive exploitation if continued further in inshore areas would leak to undesirable economic over fishing and conflicts between the artisan and mechanized sectors. Conservation or inshore fish stocks hence would require managerial measures to avoid commercial depletion of coastal resources.

c) Diversification of fishing :

In the inshore areas diversification of fishing activity has to be encouraged to reduce the fishing pressure on the demersal fishes particularly the shrimp resources. For this, target fishing would be the ideal answer and if needed financial assistance may be provided to shrimp trawl owners for diversification.

d) Standardization of effort :

In marine fisheries of India, like in any other tropical multispecies fisheries, calculation of the standard effort is needed for suggesting the required effort to be employed for management of fisheries. Standardization of fishing effort in terms of widely used gears for various commercially important species for exploitation on a sustained basis.

e) Maximum sustainable yield :

Estimation of MSY may be considered an s important as an upper limit to catch that can be taken from a stock. Changes in the MSY level of fish resources year after year are natural. To fish at changed MSY level, effort has to be reduced correspondingly which can be estimated especially through surplus production models. The challenges for the scientists are to estimate MEY and OSY for all the resources in the next two decades.

f) Deep sea fisheries development :

Deep sea fisheries resources of the country has been estimated as 1.4 million tones between 50 and 200 m depth zone and 0.3 million tones beyond 200 m depth in the EEZ. A suitable deep-sea fisheries policy (DSFP) and its effective implementation would be needed to utilize the resources. Whatever threats are visualized in the DSFP, it is necessary to evolve viable solution with long-term vision. While formulating the strategies, the in-put control such as limit on catches have to be given due consideration.

g) Amenable fishing and participatory approach :

The difficulties involved in the management of Indian marine fisheries are mainly related to the number and type of user groups and the distribution and mobility of fish

stocks. Several conflicts particularly between the subsistence.

In most cases, it is desirable to include the users of the resources and other environment stakeholders on the development and execution of a management plan as co-managers. In the interest of equality and the multiple use of the marine environment, there is a good case for fisheries to be co-operatively managed by representatives from industry and community as well as the government

h) Enforcement of conservation measures :

For sustainable development and management of fisheries, suitable direct, indirect and technical conservation measures and the effective enforcement of existing regulations are needed. The success of the fisheries management straggles generally depends on the total implementation of one or more of the conservation measures at a time.

The conservation measures should consider imposing ban on monsoon fishing throughout the also on night trawling activities by the bottom, midwater and pelagic trawlers, purse seining and ring seining. A also, to conserve the demersal resources especially the shrimps

i) Managerial skill :

The implementation of fisheries management policy by the regulator is a difficult task .the regulator should ensure that the resources user s abide by the legislative and regulatory the fairest extent. For effective management of fisheries resources, the managers require a much wider range of political legal, sociological and above all conflict resolution skill, rather than specialized skills of assessors.

j) Discards :

Discarding of marine e biomass is experienced as an acute problem in developed fisheries. Although, wasting the biomass occurs throughout the distribution chain, the losses are most significant at the point of capture due to deliberate dumping of fish at sea. Though, discards are grouped as 'Quota discards', 'by-catch discards' would be most applicable to our country. Because of the switching over from single day to multi-day fishing in most of the areas the 'discards' problem would certainly become acute by the turn of the century. This problem can only be addressed effectively by a significant shift in the behavioral attitude of the fisheries resource users, rather than formulating other strategies to minimize the same.

k) Ecologically sustainable development :

As the catch per unit of effort is declining in most of the fisheries, management of single species would have little scope in future. Hence, the concept of single species

management may require a replacement by the concept of more broad based ecosystem management that supports all the marine species.

As the marine environment is under pressure from many different production and service sectors like commercial fishing, subsistence fishing, recreation fishing, coastal aquaculture, tourism, water sports, shipping, coastal development and industrial development, the decline in catch rates should be viewed not mainly due to fishing pressure but because of the environment deterioration.

l) Potential fishing zones :

There is the urgent need for the effective utilization of the 'Remote

Sensing programme' through the 'Marine remote e sensing information' for accurate delineation of potential fishing zones by the user community. This system has facilitated the prediction of fisheries potential and production prospects in the EEZ, and rapid spread of this information to the user community.

m) Regulatory machineries :

Regulatory machineries should be strengthened, expanded, properly trained; they should be vested with more power for enforcement of law. Discharging of untreated sewage; industrial effluents should be strictly banned. Heavy penalty should be imposed on the offenders, no culprit should go unpunished.

n) Use of Molecular Techniques :

Genetic characterization of populations, which is not in practice in India, should be initiated without delay with the help of dependable genetic tools like karyotyping, electrophoresis and DNA finger printing for assessing the extent of damage already caused to native germplasm and them to evolve the modalities of rehabilitation if required.

Inland Sector :

a) All small water bodies (ponds and tanks) should be registered with the state fisheries departments including those seasonal water bodies, which retain water for more than three months and should be brought under culture.

b) Those under multi ownership and where owner is not present, the water body should be given to village panchayat or fish production groups (Saha &Acharya, 1989) for the purpose of aquaculture.

c) Keeping any productive water body fallow should be treated as offence.

d) Inputs should be supplied by the Govt. or Govt. authorized agency at fixed rates.

e) Technologies suitable under local conditions should be extended to the fish farmers by the Fisheries Department.

f) State Fisheries Department may get the work done through agencies like FFDA, Apex fisheries co-operative Society or Fisheries Corporation etc. under their supervision.

g) Mobile dispensary, fold chain are also to be organized for overall development of inland fisheries.

h) Reservoir areas to be let out to fisheries co-operatives for regulated exploitation, and poaching control only. Stocking, stock manipulation, development of productivity and marketing of produce will be in the hand of the State Govt. Economic interests of the fishermen in respect of their produce should be protected.

i) Development of weed-infested beels is a problem of high magnitude. It may not be possible to take up entire area for development at a time. Work may be taken up by State Department in phases.

j) Intensive cage culture of air-breathing fishes at the fringes of beel waters will serve as a source of extra income to the unemployed family members of local villages as well as increases fish production.

k) Juveniles of both fish and prawn can be collected and reared in ponds or used for river ranching as is now being done in West Bengal. This activity should be taken up as a regular function of all State Fisheries Departments having reverie fisheries resources.

l) Rapid survey of reservoirs/lakes in different agro-climatic conditions of the country is required to classify them based on their ecology and formulates management measures for each group through detailed experimentation.

m) There are conflicting interests of various users of inland waters. Common property nature of resource with open access creates problem for management. In case of rivers flowing through more e than one state, the exploitation policies are at variance with none caring for conservation or development of fisheries. Perhaps, creation of an inter-state Riverine Fisheries Board should be considered for formulation of a rational and ecological sound development and exploitation policy for fisheries of such rivers. Stringent control measures have to be exercised on the use of water resource by industry and other users.

n) Fisheries being a state subject under the constitution, Central Government has very limited control as rules and by-laws are framed by State Governments

under enabling powers as incorporated in Section 3 of Indian Fisheries Act, 1897. This Act was promulgated at a time when there was negligible environmental degradation and considerations. This Act needs be revised and efforts made for strict enforcement of legal provisions.

Aquaculture

World aquaculture dates back to china from the 5th century, its development has been confined to a few regions and at present there are about 190 sp. Known to be cultivated of which more than 10 acre being cultured in southeast Asia. The Asian region has been and still is the center of aquaculture production and diversity. Aquaculture in India has witnessed remarkable progress particularly during the post independence period. Apart from substantial contribution to the national economy it has emerged as a lucrative venture of growing industry. Over the years the country has made great strides not in increasing the total aquaculture production but also enhancing the unit productivity from a subsistence level to mean national productivity of about 2 t/ha/yr through adoption of scientific culture technologies. The production has shown a quantum leap from 0.51 million tones in 1984 to 1.63 million tones in 1994 registering 215% increase during the period. However, bulk of the production is contributed by a few species of carps. Though aquaculture in India is carp-based and carps contribute, as much as 89% of the total aquaculture production at present, the country possesses vast potential in terms of other species resources for diversification.

The catches from the rivers have dwindled considerably and several stretches, once the favorite haunts of the fish and fishermen alike, are now depleted of those rich stocks, which they once harbored. While increased fishing pressure is the root cause of this decline, it has largely been compounded by dam construction, water abstraction, domestic and industrial as well as pesticide and herbicide pollution.

The estuaries are a function of the rivers and the impact of the changes upstream is reflected in the ecological disturbances in the estuaries. As such, the major estuaries and lagoons also have not been spared by pollution, siltation and vegetation. The Hooghly estuary, Chilka Lake, and Cochin backwaters have their own tales of woe and have fallen in disgrace with Nature.

Unfortunately, reservoir fisheries development has not been given any serious attention despite the recommendations of the All India Coordinated Research Project on the Ecology and Fisheries of Freshwater Reservoirs to treat them as specific entities. A rule of thumb is applied to all reservoirs with no attention to such details as stocking density/ha, size of fingerlings to be stocked, species-mix, time/period of stocking etc. besides place of stocking or any preparation prior to stocking.

Never before had the world seen such a fast rate of growth as in brackish

water aquaculture. More than finfish, it was the crustaceans, which despite there low production and comparatively poor knowledge about their biology and techniques of culture. Shrimp farming which was mainly a traditional activity grew into a commercial enterprise practiced not only by small and marginal farmers but also by the corporate sector.

Recommendations:

Freshwater Aquaculture:

I) Assessment of aquatic resources available for aquaculture:

Figures relating to the extent of freshwater resources available for aquaculture and culture-based capture fisheries in the country do exist, (2.25 million ha of ponds and tanks, 1.3million ha of beels and derelict waters, 2,09 million ha of lakes and reservoirs as also 0.12 million Km of irrigation canals and channels and 2.3 million ha of paddy fields, a portion of which is available for fish culture) but they appear to be not quite reliable. A realistic assessment should be categorized in relation to size, nature (short-seasonal, long-seasonal or perennial) and productivity of the water bodies, to facilitate adoption of different types and levels of technology in different categories of water bodies and to make realistic production estimates, which would enable meaningful aquaculture planning. Remote sensing could possibly be made use of for assessing our aquatic resources.

II) Diversification of production systems:

There was hardly any diversification in the initial phase, with polyculture of carps in ponds dominating the freshwater aquaculture scenario. The need for diversified production systems to suit different types of water resources is now fully realized, and several new production systems have been initiated. While some of the earlier production systems have more or less been standardized, much remains to be done regarding the newer systems.

The major production systems presently in vogue in Indian freshwater aquaculture are detailed below:

a) Carp culture in ponds:

Carp culture in ponds has been the most successful and widespread production systems in Indian freshwater aquaculture. National mean productivity is 2 t/ha/yr. Where as CIFA shown that 10-15 t/ha/yr. can be achieved under intensive culture system. There is an urgent need to bring this to field condition.

b) Cage culture and pen culture:

Cage culture and pen culture production systems in freshwater aquaculture are only is an experimental stage at present; even though there is ample scope for the same. Development of indigenous standardized technologies in this regard should receive priority attention.

c) Waste water culture:

The technologies already developed by CIFA in respect of sewage-fed aquaculture and biogas slurry-fed aquaculture need to be further refined and popularized all over the country, with necessary modifications to suit local conditions.

d) Integrated fish farming:

This system also provides for recycling of organic wastes. The CIFA has already developed certain technologies for duck-cum-fish culture, poultry-cum-fish culture and agri-/hortculture-cum-animal husbandry-cum-fish culture. However, these require to be further refined to make them applicable to different regions of the country, taking into consideration the organic load in the pond effluent of such systems.

e) Raceway cultures and culture in recirculatory system:

These two production systems, which have high yield potential, are yet to be seriously tackled in the country. It would be worthwhile to develop standardized indigenous technologies for these sophisticated systems for adoption by entrepreneurs.

f) Culture systems for seasonal water bodies:

Indian has innumerable small seasonal water bodies, which retain water for 5-8 months only. Suitable technologies are required to be developed for gainful utilization of these waters for monoculture of all-male tilapia, stunted Indian major arps and Chinese carps, sterile common carp and freshwater prawns.

III) Diversification of cultivable species :

The culture of Indian major carps and some exotic carps still dominates the freshwater aquaculture sector to a significant extent. However, there are a number of other economically important species, which could be gainfully brought into the aquaculture fold. Some of them have already been taken up in recent years, but are mostly still in the initial phase of technology development. The more important ones are briefly detailed below.

a) Medium sized carps :

A number of medium sexed carps, like *Labeo fimbriatus, Cirrhinus cirrhosa, Puntius kolus, P. pulchellus,* etc. are economically important and, therefore, deserve to be considered for monoculture or polyculture with major carps, catfishes or freshwater prawns. There fore, it is imperative to take up studies to evolve suitable technologies for their commercial seed production and culture practices and to promote their culture in regions where they command good consumer preference.

b) Other food fishes

Even though the Mahseers, *Tor khudree,* is a slow grower in ponds; it appears to thrive well in small reservoirs. Therefore, the technologies already available for its breeding and culture should be refined further for commercial application, so that its seedlings could be introduced into small reservoirs for improving their culture based capture fisheries.

Catfishes, both air breathing (magur and singhi) and non-air-breathing (*Wallago attu, Mystus seenghala, M.aor, Pangsius pangasius and Ompok (*spp.) are in great demand in the northern parts of the country. There is as yet no organized culture of magur (*Clarius batracus*), the most important Indian catfish, in the absence of a dependable technology package for its culture. The work done under the All India Coordinated Research Project and subsequently by CIFA in this regard should be taken to its logical conclusion. Similar technology packages in respect of all other commercially important catfishes should also be evolved on a priority basis.

Murrels too have good consumer demand in certain parts of the country, but as yet there is no organized murrel culture system in the country. The existing seed production and culture technologies of Murrels should be further refined and passed onto farmers.

The Indian shad, hilsa (*Hilsa ilisha)*, was successfully bred and the resultant hatchlings reared upto two years at Allahabad in the sixties, but no further progress appears to have been made in standardizing the technology for its artificial propagation. In view of the very high consumer demand for this fish and the dwindling of its stock in various rivers, it is urgently necessary to evolve standardized technologies for commercial scale seed production and culture of hilsa, in order to be able to restock the depleted rivers and to meet consumer demand.

c) Ornamental fishes :

Apart from fairly good local demand, ornamental fishes have very high export demand. It is, therefore, necessary for R and D agencies to standardize the technologies for their mass production.

d) Freshwater prawns :

Even though the two most commercially important freshwater prawns (*Macrobrachium rosenbergii* and *M. malcolmsonii)* have good demand both within and outside the country, their breeding and farming have received serious attention only recently. Hatchery technology has already been worked out for both the species; but while several commercial scale hatcheries have come up in the public and private sectors for *M.rosenbergii,* commercial scale hatchery for *M. malcolmsonii* is practically non-existent. In view of the tremendous scope for their culture in India, it is urgently necessary to evolve viable package of practices for their sustainable culture.

e) Freshwater pearl culture :

It is reported that some entrepreneurs have already started freshwater pearl culture on a commercial scale. It is now necessary to standardize the technologies for commercial scale mussel hatcheries and culture systems, development of better nuclear material, commercial production of cultured pearls and post-harvest up gradation of pearls.

IV) Seed survival:

At present, the survival of fish seed from spawn to fingerling stage is generally less than 25%; Efforts must be made on a priority basis to increase the survival rate to at least 50%, which would mean substantial saving in the cost of seed.

Coastal Aquaculture:

I) Assessment of coastal areas suitable for brackishwater aquaculture:

The presently available figure of 1.19 million ha requires updating with the help of remote sensing data and G.I.S. information. A reliable assessment of the brackishwater aquaculture resources in relation to size, nature and suitability for different types of production systems would enable the authorities to make meaningful brackishwater aquaculture planning and realistic production estimates.

II) Production systems and cultivable species:

Scientific coastal aquaculture is a relatively recent activity in India. In earlier years, brackishwater aquaculture was confined to tide-fed and auto-stocked coastal low-lying areas in West Bengal and Kerala, while mariculture was practically non-existent. The long stagnation in world fish production from the late sixties to mid-seventies, due mainly to stagnation in marine capture fisheries, gave a fillip to the growth of coastal aquaculture in the world, including India. The progressively increasing demand for shrimps in the international market resulted finally in the establishment of innumerable shrimp farms by the private sector in India's maritime states in the eighties, mainly along

the east coast. The government sector too became active during this period and established several hatcheries and R and D centers for coastal aquaculture of finishes, crustaceans, molluscs and seaweed's.

Brief details of various production systems and species cultivated are given below:

a) Traditional coastal aquaculture ("Trapping and holding system") :

This was initially practiced only in West Bengal and Kerala, but it later spread to Karnataka, Goa and Orissa. I n the initial phase of this system, there was no external inputs (seed, feed and fertilizers) at all. Later on, some farmers started resorting to periodic stocking of shrimp and fish seed to increase stocking density, while some even resorted to pond preparation and use of fertilizers. The average yield in this system varies from 350-1000 Kg/ha/season in different states. It is desirable to bring all these traditional culture impoundments under the improved extensive culture method.

b) Shrimp culture :

In view of the high economic value of shrimps, it is necessary; to continue and expand the culture of the presently cultivated species and to bring in all other commercially important species after standardizing their hatchery and culture technologies. It is highly imperative to refine the existing technologies relating to *P. monodon* and *P. indicus* in order to arrive at sustainable production technologies for various levels of culture.

c) Other crustaceans :

Crabs and lobsters have good export potential, of the five candidates species of crabs only *Scylla serrata* and *S. tranquebarica* are presently receiving some attention. Crabs can be included in polyculture with milkfish and mullets. As yet, no viable hatchery and culture technologies have been evolved for crabs and lobsters in India with the result they are yet to be taken up for commercial culture. This, therefore, requires urgent consideration.

d) Fin fishes :

There is no commercial marine finfish cu8lture in India so far, although a number of candidate species are now receiving attention for their hatchery production and culture. Among them may be mentioned the grey mullets *(Mugil cephalus* and *Liza macrolepis*), Indian sand whiting (*Sillago sihama*), milkfish (*Chanos chanos*), rock-cod (*Epinephelus* spp), pearl-spot (*Etroplus suratensis*) and seabass (*Lates calcarifer*).

All these have been only on experimental lines and viable technologies are yet to be evolved. It is needed to attempt their culture in ponds, pens and cages.

e) Molluscs :

A package of practices for cultured pearl production has been standardized. The species of pearl oyster presently cultured is Pinctada fucata, which is culture on rafts. A technology for production of colored pearls also has been developed. Commercial production of pearls based on technology developed started in 1983. Attempts should now be made to develop hatchery technologies for two other pearl oysters, *P.margaritifera* and *P. maxima*.

Culture of the edible oyster *Crassostresa madrasensis* through the rack and tray method, ren method and stake method has been successfully developed and the technology demonstrated through a pilot project. Packages of practices have also been evolved for the culture of green mussel and brown mussel (rope culture and long line culture) and five species of clams. On-shore culture of pearl oyster, edible oyster, clams and mussels has been planned for the early part of the next century. The proposed abalone culture is worth attempting.

f) Sea cucumber

The CMFRI has been successful in breeding sea cucumber under captivity and in raising a limited number of seed. It also attempted ranching of the sea with the few seed raised. However, it is to be stated that ranching would be meaningful only when it becomes possible to release adequate number of weed, for which purpose commercial scale seed production would be required through development of viable breeding and hatchery technologies.

g) Seaweeds :

Culture of seaweeds in open waters was undertaken successfully and its feasibility demonstrated at a couple of locations. Many types of seaweed are good sources of phytochemicals, while some are edible. There is ample scope to expand seaweed culture in a big way.

General Considerations :

Some major measures to be taken on priority basis in relation to some important parameters that are common to both freshwater and coastal aquaculture are listed below;

I) Pond Management :

a) To develop suitable guidelines for judicious application of inorganic and organic fertilizers to avoid pollution effect.

b) To encourage the use of bio-fertilizers like Azolla and to screen more such plants to ascertain their utility as bio-fertilizers.

c) To refine and standardize the existing weed control measures, while giving priority to biological control.

d) To elucidate the acceptable levels of pesticide residues in cultured finfishes and shellfishes and to determine the biological half-life of pesticides commonly used.

e) To use aquatic weeds to absorb nutrients and pollutants from the wastewater in wastewater aquaculture.

f) Evolving on-farm water management strategy in ground water fed farms when water supply decreased, possibly involving treatment and re-use.

II) Physiology, Breeding And Genetics :

a) Identification and synthesis of cheaper and more effective induce agents than those presently in use.

b) Standardization of multiple spawning and off-season breeding technologies, as also techniques for improving gonadal maturation and egg quality through hormone treatment and feed manipulation.

c) Standardization of techniques for sex reversal through hormonal treatment or hybridization to produce monosex or sterile individuals.

d) To raise new varieties and inter-specific/inter-generic hybrids with superior culture qualities through selective breeding and hybridization respectively and their appraisal.

e) Standardization of chromosomal manipulation techniques, like gynogenesis, androgenesis and polyploidy, for developing genetically improved strains.

f) Commercial production of sterile triploid grass carp for stocking in reservoirs and irrigation canals.

g) Study of digestive physiology of commercially important finfishes and shellfishes in order to be able to develop balanced cost-effective diets.

h) Production of transgenic finfishes and shellfishes.

i) To improve the existing technology for cryopreservartion of milt and development of a suitable technique for cryopreservation of eggs, for ensuring seed availability throughout the year.

III) Nutrition :

a) Determination of nutritional requirements of various stages of presently cultivated finfishes and shellfishes and of candidate species for culture other than of those already studied.

b) Development of suitable diets on the basis of findings of the study on nutritional requirements as suggested above.

c) Determination of dietary vitamin and mineral requirements for improving gonadal maturation.

d) Development of least-cost diets through fishmeal substitution by unconventional feed sources.

e) Determination of merits of various non-hormonal growth promoters.

f) Development of technology and promotion of commercial scale production of single cell protein (e.g. Spirulina).

g) Incorporation of 'probiotics' in fish feeds for deriving better-feed conversion and growth.

IV) Pathology :

a) To evolve effective curative and prophylactic measures on a war footing to tackle-devastating diseases like "EUS' among fishes and white spot disease among shrimps.

b) Standardization of rapid immuno-diagnostic methods for bacterial, viral and fungal diseases of finfishes and shellfishes.

c) Development of an immuno-diagnostic kit that could be easily used by farmers.

d) Development of vaccines against important parasitic, bacterial and fungal diseases of finfishes.

e) Elucidation of effect of immuno-stimulants on resistance to diseases in fishes and shellfishes.

f) Development of fish and prawn cell lines for disease control investigations.

g) Studies in inducing immunity in fishes through the use of 'probiotics which are generically engineered to produce antibodies against harmful bacteria, instead of using the costlier commercial immuno-stimulants.

h) Development of proper certification and quarantine systems and establishment of a network of quarantine centers throughout India in respect of import and export of finfish and shellfish.

i) Development of a disease reporting information system to meet WTO and GATT protocols.

V) Aquaculture Engineering :

a) Standardization of parameters for aquaculture site selection.

b) Standardization of designs of infrastructures required for various aquaculture production systems (ponds, cages, raceways, recirculatory systems, pens, racks, hatcheries, waste treatment plant, etc.)

c) Standardization of equipment's and accessories used in aquaculture (aerators, biofilters, automatic feeders, mechanical harvesting and handling systems, etc.)

d) Study of relation of pond design (shape, depth, dimensions, etc.) to fish production.

VI) Aquaculture Economics :

a) Economic evaluation of each aquaculture production system to identify economically viable systems.

b) Economic evaluation of aquaculture inputs, such as seed, feed, fertilizers, etc.

c) Study of socio-economic impact of aquaculture.

Environmental Issues

Its true that man is an integral part of nature, the dividing line between man and nature is due to the all-pervasive ego. Unless the ego is dissolved and reconciled with the fundamentals of nature, the conflict between man and nature will continue. The ego manipulates itself in the form of technology, innovations, desire to accumulates desire to exploit selfishness and greed. Only if the ego is dissolved can man function to enable the evolution of a technology, which is humane and will work towards catering of needs and not the fulfillment of greed.

Recommendations :

a) Standardization of procedure for environmental impact assessment (EIA)

b) Carrying out appropriate EIA on mandatory basis before embarking on large aquaculture projects.

c) Standardization of techniques to prevent environmental degradation through effective treatment and management of the farm effluent.

d) With regard to the existing Supreme Court order relating to aquaculture activity within the CRZ and pending the passing of government's proposed aquaculture bill by parliament, it is suggested that instead of demolishing the existing semi-intensive and intensive farms located within 500 meters of the CRZ, they may be converted in to improved traditional type, which is permitted by the Supreme Court, and their productivity increased through controlled fertilization and artificial feeding, with appropriate effluent treatment.

e) Give emphasis of proper environmental impact assessment at the project stage itself.

f) Maintain specified distance between farm units, between nearest freshwater canal and an aquaculture unit and also from the nearest drinking water sources.

g) Do not overstock the ponds

h) Have separate water supply and drainage systems.

i) Use organic manure and fertilizers at optimal doses.

j) Do not discharge the wastewater into the open environment t or drainage canal without proper treatment.

k) Resort to aeration and daily water exchange for maintaining good water quality and for reducing organic load.

l) Incorporate Environment Monitoring Plan and Environment Management Plan in all projects above 20 ha area.

m) Identify zones of suitable and unsuitable areas using remote sensing data, Geographic Information System etc., and prepare Master plan for development.

n) Destruction of mangrove areas and ecologically sensitive wetlands and conversion of agricultural and other productive lands should not be permitted.

Harvest And Post Harvest Technology

World catch of fish has increased in the 1970's and 1980's but seems to have stabilized since 1988 to just around 100 million tones. As the human population is ever increasing, the tendency for demand to exceed supply is also increasing, resulting in widening supply/demand gap. This has the inevitable consequences of reduced availability,

rising price and a search for alternative resources to close the gap. Limited availability will be particularly severely felt by people in developing countries to whom fish is often the most important source of animal proteins as well as a culturally acceptable food. Action will be required on a variety of fronts and better integration of all the scientific, technical and economic disciplines will be necessary. The post harbest6 technologist will have to play a more prominent role in this team.

Recommendations :

a) Fishing gear selectivity :

It should be ensured that fishing gear, methods and practices, to the extent practicable are sufficiently selective so as to minimize waste discards, catch of non-target species, both fish and non-fish species and impact on associated or dependent species and that the intent of related regulations is not circumvented by technical devices. Information on new developments and requirements is made available to all fishes and in turn fishers must co-operate in using them.

In order to improve selectivity, while drawing up laws and regulations, the range of selective fishing gear, methods etc. available to the industry must be taken into account.

Select and relevant institutions should collaborate in developing standard methodologies for research into fishing gear selectivity, fishing methods and strategies. International co-operation should be encouraged with respect to research programs for fishing gear selectivity, fishing methods and strategies.

b) Need for environmentally friendly fishing techniques :

There is a growing concern with regard to the impact of heavy ground gear like bottom trawl on the morphology of the substrate and the damage it causes to the sponges, coral beds and other benthos. Gear trials and evaluation of semi-pelagic trawl systems indicated supremacy over the conventional demersal trawling systems. In the semi-pelagic trawl system where the footrope is at a height above the seabed and fork type rigging, there is less environmental degradation of the seabed (Mousey, et.al. 1997)

c) Responsible fishing to be compliimented with responsible trade :

There is a urgent need to check and have control measures to avoid sale of juveniles and also regarding the present fishing overcapacity and absence of adequate controls which may endanger future fisheries resources and economic benefits.

"Fish that should not be caught should not be traded" (Anon, 1997).

d) Energy optimization :

States should promote the development of appropriate standards and guidelines, which would lead to the more efficient use of energy in harvesting and post harvest activities within the fisheries sector.

States should promote the development and transfer of technology in relation to energy optimization within the fisheries sector and in particular, encourage owners, charterers and managers of fishing vessels to fit energy optimization devices to their vessels.

Fuel-efficient fishing methods- like lobster trap provided with an escape gap as conservation measures (Developed by CIFT) and Gill net. By these gears we can able to avoid the overexploitation. So its need of the time to develop these kind of gears.

e) Harbors and landing places for fishing vessels :

An institutional framework must be established for the selection or improvement of sites for harbors for fishing vessels, which allows for consultation among the authorities responsible for coastal area management.

While designing and constructing harbors the following points have to be kept in mind:

1) Adequate servicing facilities for vessels.

2) Adequate freshwater supplies and sanitation arrangements.

3) Waste disposal systems should be introduced including disposal of oil, oily water and fishing gear.

4) Pollution from fisheries activities and external sources should be minimized.

5) Arrangements should be made to combat the effects of erosion and siltation.

f) Artificial reefs and fish aggregation devices :

States should develop policies for increasing stock population and enhancing fishing opportunities through the use of artificial structures, placed with due regard to the safety of navigation on or above the seabed or at the surface. Research on the use of such structures and its impact on living marine resources and the environment should be promoted.

g) Suggestions for implementation of responsible fishing :

1) Information on new developments in fishing technology and requirements of

responsible fishing must be made available to the fishermen and their involvement encouraged in the decision-making process and implementation of the code of conduct.

2) Environmentally friendly fishing techniques must be encouraged.

3) Fuel saving fishing methods like gill netting and trap fishing to be adopted on a larger scale.

4) Need for co-ordination of all relevant government agencies in order to ensure that policies and actions are not countered productive. Support to agencies helping in reallocating excess fishermen by providing training for new skills and initiating special land schemes for fishermen.

5) Artificial reefs and fish aggregation devices should be developed on a larger scale.

6) Development of infrastructure like landing places and fishing harbors with due regard to waste disposal system and pollution control.

7) Employment of fishing techniques like line fishing and gill netting to reduce by catch to minimum. Similarly square mesh in a trawl and exclusion devices reduce the by-catch of non-target and immature fish.

8) Ban on export of undersized fish.

Human Resource Development

After independence, India has achieved significant progress in preparing trained R and D personnel through the infrastructure built in the form of universities under the UGC and the central institutes, fisheries colleges in various states and under the ICAR and CSIR. There personnel possessing postgraduate degree in general and doctorate and pot doctorate research degrees in particular have shown themselves as a potentially useful band o researchers bringing the fisheries research on par with world class R and D elsewhere. The institutions having overlapping objectives and limited financial support are not able to optimally utilize the human resource potential, this is where we need very serious thought as to how to put these personnel in the right places with the institutions having well defined non-overlapping objectives.

It can be stated that, a certain level of manpower available with the various fisheries institutions in the for of scientists, technologists, researchers, administrative personnel and other supporting staff are working on the similar aspects or programs but in different organizations. If these institutes are recognized with well defined specific objectives, the human resources spread over in many institutions would be really redeployed

to achieve more and high degree of excellence with the same resource and simultaneously the duplication in the work as well as the manpower problem will be reduced to a great extent.

> On the other hand, the recent setback caused in coastal aquaculture due to disease

Outbreak has proven beyond doubt the poor entrepreneurial acumen of the workforce involved in fisheries activities of our country. Likewise, inspite of having demonstrated the possibilities of taking production to the tune of over 17,000 Kg/ha/yr. The low average yield of 2,180 Kg/ha/yr. presently obtained from FFDA ponds speaks of serious lapses on the part of managerial skill of the involved manpower in aquacultural pursuits of the country. Scenarios relating to the management of other fisheries resources are also not much different. All these suggest that our country now needs more of well-trained resource managers rather than resource explorers or exploiters.

Recommendations :

I) Development of professional competency:

a) Managerial effectiveness:

Basically the job of a manager is to direct the activities and the people under him to reach pre-determined objectives with the optimum use of resources available to him. The job of a manager can be looked upon as a process involving five basic steps, namely,

1) Planning: It is connected with achieving the desired goals.

2) Organizing: It's aimed at integrating the available factors into an optimum relationship with a view to effectuate plan.

3) Staffing: It seeks to select and develop the performance or manpower.

4) Motivating: It aims at inspiring and inducing the people within the organizing to direct their efforts towards the implementation of the plan.

5) Controlling: it takes care of evaluating the performance of manpower periodically and attempts to ensure that the activities are actually executed in consonance with the plan.

b) Leadership:

Leadership can be defined as an activity of influencing people to strive willingly for group objectives. The sources of a leader's powers and influence include the following:

1) Reward power: i.e. the power to compensate or give rewards for tasks successfully accomplished.

2) Coercive power: i.e. the power to punish.

3) Legitimate power: i.e. the power of lawful or formal authority.

4) Referent power: i.e. the power to cause others to imitate one's personal style or behavior.

5) Expert power: i.e. the power of superior knowledge, ability or skill.

c) Motivation:

Motivation can be defined as a willingness to expend energy to achieve a goal or reward. It is a force that activates dormant energies and sets in motion the action of the people. It is the function that kindles a burning passion for action among the workforce of an organization. The purpose of the motivation, therefore, is to create conditions in which people are willing to work with zeal, initiative, interest and enthusiasm, with a high personal and group moral satisfaction, and with pride and confidence in most cohesive manner so that the goals of and organization are achieved effectively.

d) Communication:

Communication is one of the most basic functions of management. The manager can make a good decision, think out well conceived plans, establish a sound organization structure and be well linked with his associates .The manager cannot get the work done through his subordinates unless he is sure of some basic facts i.e. what he wants to be done? How it is to be communicated and what results are expected from the communication. It is, therefore, very necessary for the management to have a properly developed communication system.

Communication can be defined as "the process of passing information and understanding from one person to another. It is essentially a bridge of meaning between people". The importance of communication in any managerial process can hardly be over-emphasized. If an organization is to operate a an integrated unit, it is necessary that the top management should keep the lowest level supervisors and employees well informed of its ultimate objective and what it wants each person to accomplish towards their realization. By freely sharing information, the management takes employees in confidence, prepares them for desirable changes, avoids misunderstanding and makes them more knowledgeable about the problems and policies of the enterprise.

II) Improvement of fisheries education :

a) Uniformity in fisheries education :

At present, the CIFE, Fisheries colleges and Agricultural Universities are imparting the degree and post-graduate fisheries education in different states. The courses and curriculum are made as per their suitability and convenience. There is a gap in proper knowledge, know-how, technological innovations and their implementation in the country. There is a severe need to run the courses on similar or uniform basis at national level to avoid duplication.

b) Advancement in the teaching :

The teaching methods adopted should be made available to all with modern audio-visual systems at national level like preparation of slides, audio and video cassettes etc. The teacher should be appraised with the latest technologies and its implementation through establishing a National Center for Human Resource Development.

c) Revision of syllabus :

In fisheries, the major courses covered include capture fisheries, culture fisheries, processing, harvesting etc. The syllabi are more or less similar at various levels. There is an immediate need to revise the syllabi at national level for the improvement of the quality of the education system. Syllabus prescribed should be a model for students and need based.

d) Uniform system of admission;

At national level, various universities are conducting examinations throughout the year. This creates lot of inconvenience for the planners and administrators. A uniform system of admission if adopted by all agricultural college/universities will help the nation for future planning and conducting admission tests.

e) Development of laboratories and aqua-farms:

There is an immediate need to establish model laboratories in different states in different disciplines for better scientific and research environment so that the recent developments should be used for better manpower training.

f) Manpower planning and management :

To educate and develop the manpower, a proper planning is very much essential. In education system, there is an urgent need to plan the courses in fisheries based on self-generation of funds in future. Besides, educational planning should be in such a manner at national level that it should be able to improve the status of the industry, rural and tribal mass through the schemes for various upliftment purposes.

g) Concept of fishery estate :

This is a very important aspect for fishery. A good number of manpower's are required for fisheries development. But due to lack of infrastructure in the rural areas an educated youth does not want to serve the rural mall. As a result, the ultimate aim of education the people is not achieved. I f the fish farm, tribal area and rural areas have the basic infrastructure like good school, hospital, road, market and other useful facilities, than our lab to land concept can be transferred to the beneficiaries and will be meaningful.

h) Incentive to teachers, trainers and managers :

A fishery is such a field, which calls for day and night working. Whether the person is a teacher, trainer or manager, they have to work in the field, on-farm training etc in rural areas, for which some incentive is must to encourage people to work in remote areas, which is lacking at present.

i) Linkages between central and state departments :

For better and proper utilization of technologies need-based research, training and extension programs are essential. There should be a central body to initiate the requirements time to time on regular basis with proper monitoring.

Scoio-Economic Issues

The second most populous country, India accounts for 16% of the world population with just 2.42%total world area. This indicates the strain on our natural resources and the importance of judicious utilization of these resources to the optimum level for the benefit and well being of our expanding population

Recommendations :

I) Prime importance should be given towards the creation of infrastructure and its development in the fisheries sector. The infrastructure gaps hindering the progress of speedy devevelopment sector for out weighs the achievement. It should be covered either under central schemes or centrally sponsored schemes. The main activities include like,

a) Setting up of fishing harbors/ports.

b) Inland fish marketing.

c) Preservation of fish and setting up of fish hatcheries.

II) Government intervention is required in framing the guidelines for use of natural resources, polices related to the social development, for example, land tenure, education, health care, provision of alternate employment etc. and integrated resource management.

III) Fishermen need to be thoroughly educated on priority to receive thorough insight in their occupation/profession on scientific basis.

IV) The members of the fishermen community need to be given admission in the fisheries degree and post graduate degree, vocational courses on a quota basis.

V) Fisheries cooperative societies need to be strengthened and streamlined. Fishery cooperatives have to reorient and readopt their structural functioning and management. Action plan in the areas of better functions of fishery cooperatives will therefore be focused on under mentioned aspects:

a) Professionalism and efficiency through management.

b) Introduction of modern technology.

c) Strengthening financial resource base.

d) Mobilization of resource.

e) Providing fishery requisites, marketing and storage facilities, basic infrastructure, diesel, ice, freezing and processing plants, transport facilities, maintenance workshops, credit facilities etc.

f) People's participation.

g) Overall development of fisher folk.

VI) 'Extension' should be strengthening in fisheries because it maintains a continuous contact between research institutes on one hand and the development departments, industries, farmers, students and weaker section.

VII) Fisheries Extension needs

a) Knowledgeable Extension officer who is fully alert.

b) Extension centers have to be equipped with latest communication aids comprising different audio-visual equipment's like TV, VCR, still and video Cameras, Computers, Channel network, Tape recorder, sidle and over head projector, STD, fax, Xerox, working and most advanced printing technology.

c) Training and exhibitions have to be conducted for improving and informing farmers.

VIII) Computers now a day have become essential in every walk of life and the field of fisheries stands no exception to it. Internet, Remote sensing and Geographical

Information System (GIS) are classic example of converting this potential into a reality.

Conclusion

It is time to recall that India was one of the pioneers amongst developing countries to list its biota, especially aquatic fauna back in the last century and develop its cadastral maps by survey of India. Indian advancements in the field of fisheries were foremost in Southeast Asia till the fifties. When Indians were experimenting carp and shrimp culture and demonstrating results, only China was at the same level, while, Indonesia, Thailand, Philippines, Taiwan were busy denuding their mangroves for milk fish culture. Today these countries have raced much ahead, albeit with sad experiences of catastrophes of pollutional collapse of shrimp culture due to lack of monitoring of pond environment and knowledge to deal with diseases. Ironically, India having known about the first to motorize their fishing crafts, but Thailand, Taiwan, Singapore advanced fast and fish in international water all aver South-east Asia, while we are unable to tap our own EEZ beyond 50 m depth. The lost ground has to be regained and India has to regain her glory. For this several challenges are to be taken by the horn, for which politician, bureaucrats, economists, planners and fisheries experts have to come together.

The globalization of technologies and free trade is a reality and would only get strengthened as we walk into 21st century. So would be the need to protect environment and ensure sustainability of the productive resource base. The conflict would lead to more restricted availability of quality land and water for aquaculture and cut throat competition from abroad for market share facing sea fisheries. These challenges will have to be met by not multiplying institutions but by strengthening and consolidating the available resources and the vast pool of scientific expertise across the country. Developmental authorities and decision makers at the National Planning level would need to give a hard look at the requirements of change at the legal and regulatory frame and assess investment needs and bring equity amongst alternative food production system. preferably by increasingly integrating aqua foods with land based foods and removing bottlenecks facing the enterprising Indian capability in fisheries and aquaculture.

CHAPTER XXIV
SUBSIDIES IN FISHERIES

Introduction

A Subsidy is a payment, which is made by the government (or possibly by private individuals), which forms a wedge between the price consumer's pay and the cost incurred by the producers such that the price has been less than marginal cost. Protection to home industries is granted by giving subsidies to the domestic producers. Especially when the cost of production high and domestic products are incapable of either competing with foreign goods or sell goods at a cheaper rate, the government may give them subsidies in the form of tax exemptions, development rebate or tax remittances or a segment of the cost of production may be also be borne by the state. Further inorder to encourage the exporters they be given export bounties. Export bonuses or bounties in effect artificially bring down the domestic price of goods to be exported and thereby the exporters will be in a position to sell them at a lower price in the foreign market. Thereby steeping up exports. So generally all subsidies tend to reduce the imports and increase the exports thus resulting in diversion of resources from more efficient to less efficient users.

Subsidies are given both by the government and the multinational agencies. The important agencies giving subsidies are MPEDA, NABARD and GOI

MPEDA

The MPEDA came into existence in 1972 under the Marine Products Export Development Act 1972 (No13 of 1972). The role envisaged for the MPEDA under the statute is comprehensive – covering fisheries of all kinds, increasing exports, specifying standards, processing, marketing, extension and training in various aspects of the industry.

Financial services of MPEDA

MPEDA offers grants and subsidies to the industry from its own resources and recommends concessions and credits from other institutions. it offers funds for airlifting samples of new products to new markets. It organise supplies of inputs like mafron gas, refrigerated units for frozen cargo vessels etc. MPEDA prepares feasibility reports on processing plants, cold storages, fishing vessels on the basis of which entrepreneurs can obtain finance from commercial banks and other institutions. It makes recommendations to the Government of India on the import- export policy for the fishery industry and formulate incentive schemes.

Table :24.1 MPEDA subsidy schemes for seafood processors

Sr. no.	Name of the scheme	Objective	Rate of assistance
1	Subsidy for automatic flake/ chip tube ice making machine.	To assist seafood processors to install machines for production of quality ice required for in-plant use.	25% of the cost of the machine subject to a maximum of Rs 2.00 lakh.
2	Subsidy for generator sets	To assist the seafood processing units to have a capacity power as a stand by.	25% of the cost of generator set or Rs 2.50 lakh whichever is less.
3	Subsidy for upgrading deficient cold storage.	To enable seafood processors to upgrade their storage so as to maintain optimum temperature.	25%for improving insulation and 255for upgrading the existing diffusers, subject to a maximum of Rs. 3.5 lakhs.
4	Subsidy for acquisition of all processing machinery and equipments for production of value added marine products.	To assist seafood processors to acquire machinery and equipments for production of value added marine products	25%of the cost of machinery and equipment, subject to maximum of Rs 15.00 lakhs.
5	Subsidized distribution of insulated fish boxes.	For proper preservation of raw materials in iced condition on board fishing vessel, in shrimp farms, peeling sheds and processing plants.	Moulded synthetic insulated fish boxes of various capacity are distributed at 50% subsidy/ maximum limit
6	Interest subsidy assistance for seafood units to facilitate up gradation.	To subsidize a part of the interest payable by the plant owners to their bank/ financial institutions for the loans availed by them for modernization of their plant to achieve conformity to EU standards.	The subsidy eligibility will be restricted to a maximum of 7% of the interested charged by the bank/ financial institutions over and above the international interest 7% or actual rate of interest over and above the international interest i.e. 7% whichever is less.
7	Assistance for establishment of chill room facility in seafood processing plants.	To assist seafood processors to set up chill room facilities in their processing plants for preserving the quality of the raw material at proper temperature starting from harvest till processing.	25% of the cost of establishment of chill room facility subject to a maximum of rs3.00 lakh per chills room and the assistance would be available for a maximum of 2 chill rooms in a processing unit.

8	**Assistance for installation of Water Purification System in seafood processing plants.**	**To assist seafood processors to establish suitable Water Purification Systems in their processing plants for achieving equivalency to EU norms with regard to water quality.**	25% of the cost of installation of Water purification System subject to a maximum of Rs 2.50 lakh per unit.
9	Assistance for setting up of Effluent Treatment plants in seafood processing plants.	To encourage seafood processors to provide effective Effluent Treatment Plant in their processing units for achieving equivalency to EU norms.	25% of the cost of setting up of Effluent Treatment Plant subject to a maximum of Rs. 7.00 lakh per unit.
10	Financial support for acquisition of refrigerated truck/ containers.	To encourage seafood processors to acquire Refrigerated trucks/ Containers for the transportation of raw material/ finished products.	25% of the cost of refrigerated truck/Container subject to a maximum of Rs 3.5 lakh.
11	Subsidy for setting up Mini Laboratory	For effective implementation of in process quality control.	50% of the cost of mini laboratory to a maximum of Rs 0.5 lakh per unit.
12	Assistance to seafood processors to establish captive pre- processing plants with upgraded facilities.	To bring the per- processing activities under the control of processors and upgrade the facilities on par with HACCP/ EU regulations.	50% subject to a maximum of Rs 15 lakhs for new construction of pre- processing plants, which is also linked with the capacity of workers that can be employed. In the case of renovation, the subsidy is 90% of the cost of new construction i.e. subsidy on par with new units subject to reduction of a flat 10%.

Table: 24.2 MPEDA Subsidy schemes for aquaculture

Sr. no.	Name of the scheme	Objectives	Quantum of subsidy
A	Subsidy for new farm development	For development of new prawns\ shrimps farms.	@ 25% of the capital cost subject to a maximum of Rs 30,000 per hectare water area restricted to Rs 1.5 lakh per beneficiary.

B	Subsidy for small scale hatcheries	For setting up shrimp hatchery with a minimum production capacity of 10 million seeds per annum.	Subsidy @ 15% of the capital cost or Rs 1.5 lakh for the private hatcheries, 25% or Rs
C	Subsidy for medium scale hatcheries	For setting up of shrimp hatchery with a minimum production capacity of 30 million seeds per annum.	2.5 lakh toco-operative sector and Rs 5.00 lakh for Govt sector.
D	Subsidy for setting up PCR labs in hatchery	To establish PCR in hatcheries. To set up effluent treatment system attached to shrimp farms.	Subsidy @25%of the capital cost subject to Rs 5.00 lakh per beneficiary/ hatchery
E	Subsidy for effluent treatment system	To set up effluent treatment system attached to shrimp farms.	Subsidy @50of the capital cost subject to Rs 5.00 lakh per beneficiary/ hatchery.
F	Subsidy for establishment of chill room facilities in shrimp/ prawn farming areas.	To set up facilities for post harvest care of farm raised shrimp.	Subsidy @25%of the capital cost, subject to Rs 1.5 lakh for shrimp farms with minimum water of 5.00 hectare and up to Rs 6.00 lakh per beneficiary. Subsidy @25% of the cost of establishment of chill room, subject to a maximum of Rs 3.00 lakh per beneficiary.

NABARD

Reserve bank of India was established in 1935 with a mandate to set up agricultural credit department with expert staff. Then came Agricultural Refinance Corporation (ARC) in 1963. It was renamed as Agricultural Refinance and Development Corporation (ARDC) in 1972. Then a committee called CRAFLCARD formed in 1979 and reviewed the credit structure and recommended formation of NABARD. Then NABARD Act was passed on 12/6/1982 and NABARD was established with initial capital of Rs 100 crores. It is an apex refinancing agency for the institutions providing investment and production credit for promoting the various developmental activities in rural areas but it should be noted that as such no subsidies is given by any bank.

Interest rate :

Earlier interest is at the rate of 6.5% to 8% for banks. Other beneficiaries have to pay a rate of 10-12.5% rate. That is small farmers 10% and others 12.5%

Now, for beneficiaries,

Up to Rs 7500	–	11.5%
Rs 7500 – 25000	–	13.5%
Rs 25000 – 0.2 mill	–	15%
Rs 0.2 mill & above	–	16.5%
100% export oriented loan	–	15%

For banks 4% less in each category

Margin money :

Small and medium farmers	–	5-15% of total outlay,
Large and corporate bodies	–	25%
Deep-sea	–	25%.

Beneficiaries :

Individuals, Group of progressive entrepreneur, fishermen cooperative societies, fishermen federations, state fisheries development corporations and also private companies.

Other agencies provide credit to fisheries sector through NABARD refinances are as follows;

1. Industrial Finance Corporation of India (IFCI),
2. Industrial Development Bank of India (IDBI),
3. Shipping Credit and Investment Company of India (SCICI),
4. Industrial Credit and Investment Corporation of India (ICICI),
5. State finance corporations,
6. National Cooperative Development Corporation (NCDC),

NABARDs collaboration with other agencies:

In its effort to develop the sector in a scientific manner the bank has been actively associating itself with the regional and international agencies like Network of Aquaculture Centers in Asia-Pacific (NACA), Asian Development Bank (ADB), International Development Association (IDA), Food and Agricultural Organization of United Nations (FAO), etc. Recently NABARD has been associated in a study on aquaculture sustainability and the environment sponsored by NACA/ADB/GoI. Besides, the bank also collaborates with ICAR and other related research and development agencies on a continuing basis to remain up to date on the latest developments so as to prioritize for R&D support.

Area of financing in fisheries sector:

NABARD promotes fisheries through 3 means,

1. Refinancing support,
2. Introduction of new technologies,
3. Research and Development.

1. Refinancing support :

Gives financial assistance indirectly through Cooperatives, RRBs, CBs, and others. Apart from this NABARD also extends guidance to banks and entrepreneurs in formulating and implementing projects. It supplies model schemes to banks, conducts appraisal, monitoring and evaluation studies of projects.

Marine sectors :

Traditional crafts and gear	–	catamarans, canoes, plank built boats with nets,
Mechanized vessels like	–	Trawlers, Gill-netters, Purse seiners, Long liners and Double rig trawlers,
Motorization	–	replacement of engines.

Inland sectors:

Traditional boats and nets, Carp hatchery, Composite fish farming, Integrated fish farming, (Paddy cum fish culture, Poultry cum fish culture, Piggery cum fish culture, Dairy cum fish farming, Duck cum fish culture, Plantation horticulture cum fish farming, Air breathing fish culture) Fish seed rearing, Red tilapia culture, Running water fish culture, Semi-intensive carp culture, Freshwater prawn farming, Ornamental fish breeding and rearing, Fresh water pearl culture and Cage culture.

Coastal aquaculture :

Shrimp hatchery, Shrimp farming, Brackish water fish farming, Mussel culture, Marine pearl culture, Clams culture, Mud crab culture, and Cage culture.

Others :

Feed mills, Processing plants, IQF plants, Surimi production, Rural infrastructure-fishing jetties.

Future possibilities :

Finfish culture, Bivalve culture, and Sea weed culture in coastal waters.

NABARD has been reviewing its policies from time to time keeping in view the national priorities. In early eighties major share of bank finance was allotted to marine capture fisheries but latter the attention was shifted to freshwater aquaculture and setting up of hatcheries. Now with the advancement of technical knowledge and standardization of technologies, newer areas like shrimp farming, integrated fish culture projects, Mari culture etc., are being brought under the purview of institutional finance.

Cooperative banks and RRBs disburse more than 50% of credit.

2. Introduction of new technologies :

Introduction of new technologies in fisheries development in association with other developmental agencies such as state government, ICAR institutes, Agricultural Universities. Some of them are as follows;

Paddy cum fish culture, Wheat cum fish culture, Running water fish culture, Intensive carp culture with the use of aerators, Use of treated domestic and Industrial effluent for fish culture, Giant freshwater prawn culture and hatcheries, Super intensive tilapia culture, Use of partial re-circulating system, Ornamental fish breeding, Value addition through processing techniques like individual quick freezing, Cage culture in open seas, Pearl oyster culture, Sewage fed fisheries, and Mussel culture.

3. Research and Development:

To acquire new insights it is imperative that in depth studies and research are carried out. NABARD being development-oriented organization has a special fund called R & D fund for supporting year marked research projects. The main objectives of this fund is

To promote research in areas those are of primary interest to national bank,

To support research and action oriented projects in the area of rural development.

To assist and strengthen the efforts in project preparation, appraisal, monitoring and evaluation.

During 1998-99 the Bank has allotted Rs 55 lakhs in grants for research on standardization and commercialization of technologies for the fisheries sector. NABRAD also organizes seminars, conferences, and workshops for discussing strategies of fisheries development. These national conferences are attended by scientists, bankers, executives, who are all brought on common platform so that bottle necks in implementation of fishery projects can be removed and new approaches to the developments can be worked out.

Monitoring ongoing project :

In order to extend qualitative lending's and improve its performance, it is prerequisite to know the post investment development in the fields and therefore monitoring studies are conducted by NABARD in association with financing banks.

Based on pre and post investment monitoring, necessary modifications in project formulation and implementation are undertaken. Such studies are conducted taking into consideration technical, economical, commercial, managerial and social aspects.

Based on the findings of these monitoring studies guidelines are circulated.

Bay Of Bengal Project (BOBP) and NABARDs role :

BOBP under FAO successfully implemented a pilot project that combined the features of commercial and development banking. These features of project implementation were taken into consideration by NABARD for its further activities.

About project :

It was carried out from 1982 to 1984 in 4 coastal districts in Orissa. Credit valued Rs 6.5 mill in the form of boats, nets, and bicycles for marketing were distributed through 29 branches of 9 national banks to 2500 fisher folk households. The loan was without any subsidy at the prevailing interest rate of 12.5% and refinanced by NABARD.

The project has set an example by establishing direct enduring links between the marine fisher folk and the banks. It also demonstrated that bank credit to artisanal fisher folk can be viable and recoverable by achieving 95% loan repayment.

Lending operations :

Fisheries financing started almost four decades ago for small boats and nets in the marine side but for a fillip after the introduction of World Bank assisted Marine fisheries and inland fisheries programs during seventies and eighties. It reached a peak during early nineties after economic liberalization and introduction of shrimp farming. The trend of ground level disbursements in the first three years of the 9th plan indicates a growth rate of 23% during 98-99 from 97-98 and increase during 99-2000 over the previous year. The actual ground level disbursements in the first three years of the plan period are as follows;

1997-98	–	Rs338 Crores,
1998-99	–	Rs 443 Crores,
1999-2000	–	Rs 508 Crores,
2000-2001	–	Rs 584 Crores (Projected)
2001-2002	–	Rs 672 Crores (Projected)

The schematic refinance disbursement of NABARD under fisheries sector has generally shown an increasing trend up to the year 1995-96. Subsequently, 1996-97 onwards there was decline in disbursement. The details of the schemes sanctioned and refinance disbursed in the last decade by NABRARD is as follows;

Year		Rs in lakhs
1989-90	–	974
1990-91	–	1326
1991-92	–	2119
1992-93	–	3099
1993-94	–	5520
1994-95	–	10070
1995-96	–	10714
1996-97	–	4059

1997-98	–	3262
1998-99	–	2969
1999-2000	–	2683

The physical units financed and completed through NABARD assistance as on 31 march 2000 are as follows;

Mechanized boats	–	20774 nos.
Other boats	–	71004 nos.
Brackish water aquaculture	–	4696 ha
Freshwater aquaculture	–	264000 ha

Disbursement under the fisheries sector generally showed an increasing trend until the year 1995-96. After which it was in declining phase in amount and no of loans. May be due to

- Introduction of agriculture and rural financing in large scale,
- Environmental and disease problems faced by shrimp farming,
- Initial interim order and uncertainties of the final judgment on shrimp aquaculture by Supreme Court,
- Slow progress in Mari culture,
- Mariculture disbursement not included in this report, which is, treated as separate area from 1995-96 onwards.

State wise Andrapradesh has been in the forefront of refinance disbursement. During shrimp farming crisis land locked states occupied the second and third position. In 1998-99 it is Kerala and Karnataka in 2nd and 3rd position respectively.

	Description	Rates
1.	Construction of new ponds and tanks in beneficiaries own land with proper-screened inlet, outlet and shallow tube well.	Rs.2.0 lakh/ha in the plain areas. Subsidies @20% with a maximum ceiling of Rs.40, 000/ ha for all farmers except SC/St for whom it is Rs.50000/ ha (25%). Rs .3.0 lakh/ ha in the hill states/districts and North - eastern region Subsidies @20% with a maximum ceiling of Rs.37500/ha for all farmers except SC/St for whom it is Rs.46875/ ha (25%).
2.	Reclamation / renovation of ponds/ tanks	Rs.60, 000/ha Subsidies @20% with a maximum ceiling of Rs.12, 000/ha for all farmers except SC/St for whom it is Rs.15000/ ha (25%).
3.	First year inputs (fish seed, feed, fertilisers, manures, and preventive measures for fish diseases (eus)	Rs.30, 000/ha Subsidies @20% with a maximum ceiling of Rs.6, 000/ha for all farmers except SC/St for whom it is Rs.7500/ ha (25%).
4.	Running water fish culture in hilly areas	Rs.20, 000/unit of 100 sq. meters. The above cost includes Rs 4000 towards inputs Subsidies @20% with a maximum ceiling of Rs.4, 000/ unit for all farmers except SC/St for whom it is Rs.5000/ unit (25%).
5.	Integrated fish farming	Rs.80, 000/ha Subsidies @20% with a maximum ceiling of Rs.16, 000/ha for all farmers except SC/St for whom it is Rs.20000/ ha (25%).
6.	Setting up of integrated units including hatcheries for ornamental fishes.	2) Unit cost is Rs 15 Lakhs for a hatchery of 5-10-million fry/year capacity. Subsidies @10% with a maximum ceiling of Rs 1.5 lakhs to all categories of fish farmers.
7.	Establishment of laboratories at state level for water quality and fish health investigations.	1) Unit cost is Rs 30. Lakh (for the construction of building-25lakh, for equipment, glassware & chemicals-Rs5 lakh). This is one time grant to the states for state level. Operational cost would be met by the respective states.
8.	Provision of soil and water testing kits to each FFDA.	Unit cost of each soil and water testing kit is for R s 30000. The kits are sanctioned once to each FFDA as one time grant.
9.	Aerators / pumps	Rs.20, 000/unit of two 1 hp aerators/ one 5hp diesel pump Subsidies @25% with a maximum ceiling of Rs.12500/unit for each set of aerators / pumps for all categories of aerators /pumps for all categories of farmers who have attained a level production of 3000 kg / ha / year and

		raise it further .a maximum of 1hp aerators / one 5hp diesel pump one ha water- area is admissible.
10.	Establishment of big fresh water prawn hatchery at state level (one in each concerned state) and small hatcheries to beneficiaries	1) Unit cost is Rs 30. Lakh for a big fresh water prawn hatchery with a capacity of 25 PL / year. This is one time grant to the states for establishment of hatchery at state level. 2) Unit cost is Rs 8. Lakhs for a small hatchery of 5-10 million PL/year capacities. Subsidies @20% with a maximum ceiling of Rs 1.5 lakhs to entrepreneurs only.
11.	Fresh water fish seed hatchery	Rs. 8.0 lakh for fish seed hatchery with a capacity 10 million in the plain areas. Rs. 12.0 lakh with same capacity in the hill states/districts and North-eastern region Subsidies @ 10% with a maximum ceiling of Rs. 80000 in the plains & Rs. 1.2 lakh in the hilly areas for enterpreneurs only.
12.	Transportation of fish / prawn seed	This will be applicable only for the hill states / districts and northeastern region. Subsidies @ Rs 20 for 1000 fry transported to all FFDAs not applicable to individual fish farmer .
13.	Fish feed units	Unit cost is Rs 25 lakh for building machinery and equipment. These will be set up in the private sector. Subsidies @20% with a maximum ceiling of Rs 5.0 lakh.
14.	Training of fish farmers	Stipend @ Rs .50 /day during training period of 10 days and lump sum of Rs 100 towards travel and field visits.
15.	Purchase of vehicles	50% of cost of vehicle for each new and 50% cost for the replaced vehicle.

Table : 24.3 Subsidies schemes provided for aquaculture

16.	Capital cost on pond development & cost of input for first crop	Rs 30000/ ha (MAX HOLDDING SIZE -10 ha) Subsidies @ 25%
17.	Small scale/ back yard shrimp hatchery with 2-5 million seed production/annum	Rs 100000/unit. Subsidies @25%

(Shared by Indian government & state government)

Under BFFDA PROGRAMME for extensive / semi intensive shrimp culture.

The above assistance under FFDA programme is available only once to a beneficiary.

Subsidy for the construction of new ponds and tanks, reclamation / renovation of ponds / tanks and first year inputs to an individual beneficiary for less than 1ha and upto 5ha is available with or without institutional finance in the plain areas and 1.0 ha in the hill states / districts on pro- rata basis. Above assistance in the form of subsidy is also available for developmental activities to the fishermen co -operative societies through the national federation of fishermen's co-operatives.

CHAPTER XXV

FACTORS AFFECTING THE ECONOMICS OF AQUACULTURE- A REVIEW AT FARM LEVEL.

Introduction :

Aquaculture has developed in many parts of the world in different patterns under various natural and socio- economic conditions. Generally, the primary interest is now directed toward establishing viable industries for the purpose of domestic consumption, export, employment opportunities, income distribution, or a combination of these objectives. These development objectives cannot be achieved if the producers do not attain a minimum income and profitability. The producer profit or net income per unit of land or water area (y) is mainly affected by production (Q) the cost of production and marketing (C) and the price received (P) as a shown in the basic equation below

$$Y = Q.P - C$$

Where,

Y = Net income /profit per unit water area

Q = Production

P = Price received

C = Cost of production and marketing.

There for, increase in yield reduction in costs and increase in prices are the major means's of profits. Each of these there aspects, which are based on the framework shown in fig-1, will be discussed in this chapter.

1. **Increase in production :**

As pond culture is the most prevalent kind of aquaculture used, today their material in this section is mainly based on data gathered from fresh and brackish water pond culture. The major factors affecting the productivity per unit to fish pond or water surface are the stocking rate, the survival rate at the time of harvesting, and the average weight of the individual fish at the time of harvesting, Therefore,

A. Increasing stocking rate

B. Survival rate and growth rate

These are the primary means of increasing production.

A. **Increasing stocking rate:**

A fishpond can only support a certain quantity of fish because of its limited space and natural food. These limits has been called the maximum standing crop, which is

defined as the maximum weight of a fish stock can sustain without gaining or losing weight by consuming standing crop, of a fish pond can be increased by:

i) Fertilization and supplementary feeding.

ii) Poly culture

iii) Stock manipulation.

iv) Aeration.

i) Fertilization and supplementary feeding :

The stocking rate of a fishpond varies mainly with the fertilizer of the pond. Fertilization and / or supplementary feeding can improve the fertility rate. The purpose of fertilization is to increase the production of plankton, which fish prefer as food, and the purpose of feeding is to complement the nutrients that are in short supply in the fishpond.

A fishpond's production level is usually much higher with fertilization and supplementary feeding than without. The increased level of production is reflected in a higher stocking rate and faster growth rate of the fish. Although the total cost of production is higher with fertilization and

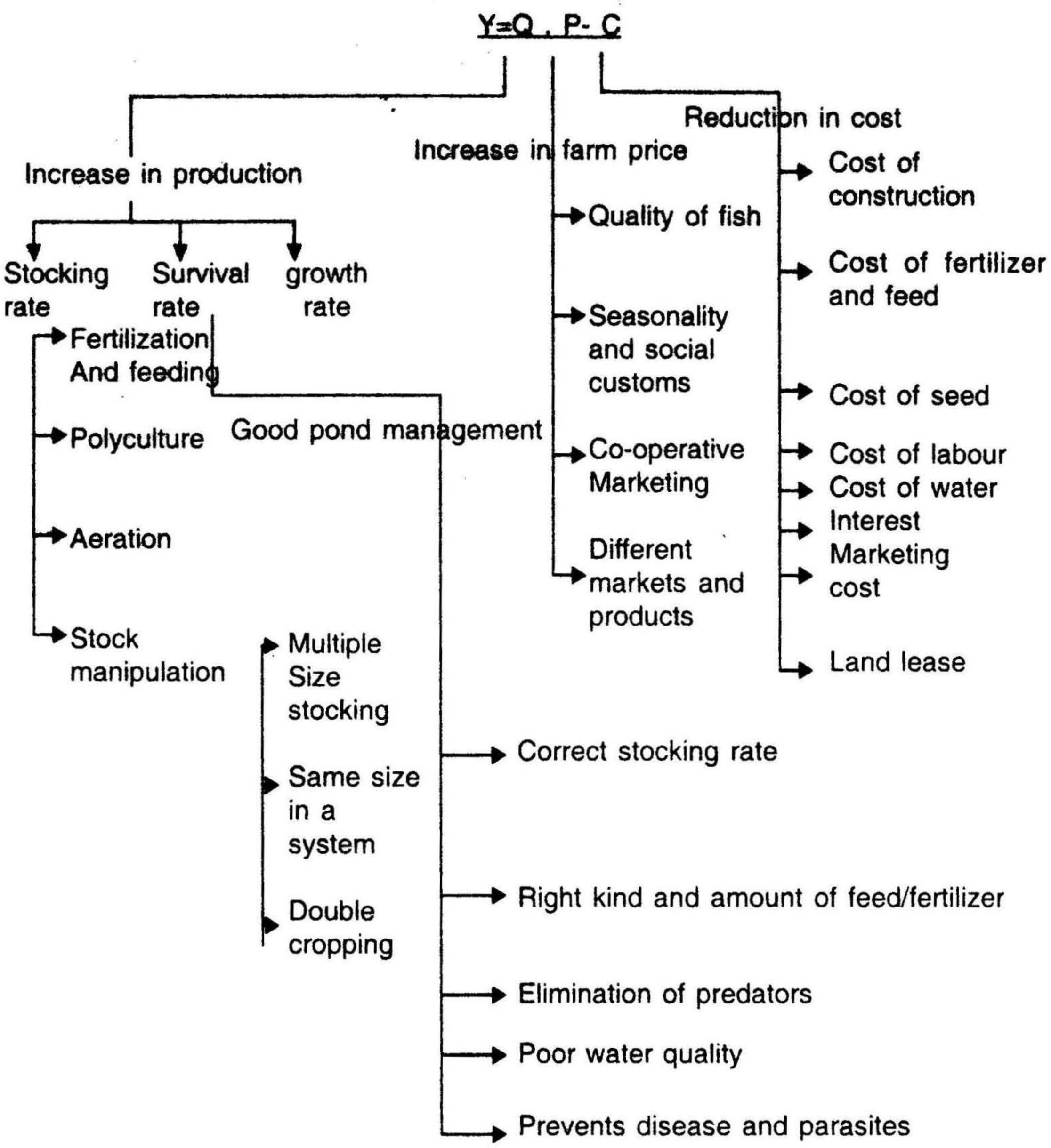


Fig 25.1: Major factors affecting the economics of aquaculture

Supplementary feeding than without, the production cost per unit of fish may be lower and the additional revenue generated may be higher than the additional cost involved.

In many cases, the percentage increases in production for intensive operation exceed the cost. There for, the cost of production per unit of output is lower for intensive than for extensive operations .For instance, studies of carp indicated that the cost of production per 1000kg of common carp in an intensive operation in Israel was about 40% less than that of an extensive operation (Taland Hepher, 1967) and the cost in India was about 25% less (Sinka, 1977) .A favorable relationship between the cost of feed and the price of carp in the United State (1:6) resulted in high profits from feeding carp (Leopold 1978)

ii) Polyculture:

Significant increase in the stocking rate, and hence in the production of certain species are often obtained through polyculture which is the rearing of several species together to make more efficient use of the growing space and the total pond environment. Any fertile pond produces a number of different fish food organisms. Most fish are selective in their diet; thus stocking different kinds of fish will efficiently utilize not only space but also food. For instance, Indian carp culturists usually stock six (6) kinds of carp together :

- Surface feeders
  - Phytophagous : Silver carp
  - Zooplankton feeder : Big head carp, Catla.
- Column feeder: Rohu
- Bottom feeder ——— (Omnivorous) Common carp;
  (Detritus) Mrigal.
- Macro vegetation feeder ——— Grass carp

In several countries, polyculture for certain species has increased production per unit of pond area, reduced fixed cost per unit of output and generated more profit than mono-culture .For instance, polyculture of different species of carps in India has increased ponds by 13 to 35% over that of monoculture (Shang and Rabanal, 1976).

Poly-culture is economically successful in stocking a high value species as a secondary crop with a less valuable species to increase the total income from a given pond area (e.g. Stocking shrimp in milk fishpond) .

In general, the species for polyculture should live in different eco-logical niches. Their food habits especially should be different. Other consideration are the availability and relative price of fry, locate climatic conditions and the market demand for and relative price of this species. Polyculture is economically feasible when total production and net income are simultaneously increased.

Stock manipulation:

The stocking rate of a fish pond can be increased by different kinds of stocking systems such as multiple size stocking in system of pond, double cropping, etc.

a) Multiple size stocking :

This may be defined as the stocking of the same species in different sizes to make more efficient use of water space. If a suitable density of fry is stocked at the beginning of the rearing period, the environment would be over crowded when the fry reaches adult size. The growth rate will be low at high densities. On the other hand, if a low density is stocked to avoid the over crowding of adult fish, the water space will not be efficiently used during the earlier part of the rearing period .The carrying capacity of a pond for different age groups is considerably greater than its capacity for any age group alone. Multiple size stocking requires periodic harvesting of the largest fish when they reach marketable size. After the stocked is thinned out, smaller fish may be added again .The continuous harvesting and stocking method not only gives the farmer a constant income and higher average price, but also thins out the stock ,thus improving the growing condition for the younger stock remaining in the ponds.eg. Multiple sizes stocking of milkfish in Taiwan has doubled annual productions. (Shang 1976).

b) **Same size stocking :**

This practice involves stocking fish of one size in one pond and when more space is needed, transferring to a larger adjacent pond (or a group of pond) .The smaller ponds are then prepared for the rearing of the succeeding batches. Milkfish farming in the Philippines is an example of these practices.

c) Double cropping :

This practice involves stocking of two species in the same pond in different seasons, thereby taking advantage of different thermal requirements of the two species. Double cropping of catfish and rainbow trout in the United States increased the net profit over 300%, as comparing to single cropping (Brown 1979).

Aeration :

In addition to the different methods of increasing the stocking rate mention above, running water and aeration can also increased the dissolved oxygen of the pond water, and hence the stocking rate. However the economic feasibility of using this technique depends on whether the additional revenues offset the additional costs.

B. Increasing survival and growth rates:

Increased survival and growth rates are important elements in increasing production and mainly depend on genetic improvements such as selective breeding and hybridization and pond management .The advantages resulting from genetic improvements are many; more rapid growth rate to shorten the rearing period, more disease resistant

strains and there by improved survival rates; greater tolerance to wide fluctuation in water temperature or other conditions such as water salinity, oxygen content Ph value and higher flesh yields. Again pond management is a crucial success factor for individual fish farmers.

Good pond management includes.

I. Current stocking rate

II. Right kind and amount of feed and /or fertilizer

III. Proper water quality.

IV. Control of disease, parasites predators and competition.

I) Current stocking rate :

An important principle of aquaculture is that a suitable density of fish should always be stocked in a pond. Under stocking may result in underutilization of feed and space, in contrast overstocking may result in competition for food and space and in a decline in the survival and growth rate. Several studies of carp culture in India revealed that excessive stocking density may lead to decrease in individual weight of harvested fish, a reduction of the survival rate and an increase of feed conversion ratio. All of these have negative effects on the production and economic results.

The general formula for determining the appropriate stocking rate and stocking ratio (under condition of polyculture and non reproduction during the rearing period) is as follows

$$S = \frac{AQ}{W2-W1} \cdot H$$

Where, S = Stocking rate (numbers)

A = Size of fish pond (ha)

Q = Expected yield per ha based on experiences of previous (in kg)

W1 = Average weight individual fry or fingerling when stocking (in kg)

W2 = Expected average weight of individual fish when harvesting (in kg)

H = Harvesting rate (%)

Right kind and amount of feed and/or fertilizer: -

Its importance varies according to the intensity of cultivation-extensive, semi-intensive or intensive. For the latter, artificial feed can be the exclusive food for fish. The practice of more or less intensive feeding is simply an economic question. The choice between the two depends on the cost of the feed, its conversion rate and the cost of land

and water. When the land (or water) is limited by high price and the additional revenue can offset the cost of feeding, intensive operation is likely to be practiced.

Artificial fish feed can be separated into two groups-those of vegetable origin and those of animal origin (Hora and Pillay, 1962). The choice of feed depends on the feeding habits, the efficiency of feed and the prices. Each species requires a different diet during different growing periods. The right kind and composition of diet will assuredly maximize growth rate. In general, the supplying of food must be timed so that the fish derive maximum growth from all the food distributed and the farmer subsequently maximizes his benefit.

The aim of fertilization of pond is to increase the production of natural food that fish prefer. There are many kinds of organic and inorganic fertilizer that can be used in fishpond. The choice of fertilizer depends mainly on soil conditions in the ponds and on the availability and prices of fertilizers. Fertilization must be done only to compensate for those nutrients found in insufficient quantities. Fertilizers should not be used when cost is equal to or greater than the extra revenue generated.

Proper water quality: -

Water temperature and dissolved oxygen are two major factors that affected the water quality and hence the survival and growth rates of fish. Each species of fish adapt to a certain range of temperature. Outside this range they cannot live. There is also a certain intermediate temperature range that maximizes the growth of fish. It is possible to influence the water temperature of a pond by increasing or reducing the water depth.

The amount of dissolved oxygen needed by fish usually varies according to the species. The oxygen content of a pond depends on the quantity of organic matter, the submerged aquatic vegetation and the water temperature (Huet, 1970). To ensure sufficient oxygen content, bottom soil may be removed or limed to reduce the organic matter; weeds should be cut; and water of good quality should be supplied regularly. It is also possible to increase the oxygen content by using automatic aeration on the water surface or under the water. This practice should be used only if the benefits derived from them are greater than the costs.

Control of diseases, parasite, predators and competitors : -

Disease, parasite, predators and competitors are factors that inhibit successful pond production. Certain disease cause considerable lost of the crop, especially under intensive farming. High stocking density, water pollution and inefficient farming condition promote fish diseases. Also, large numbers of predators and competitors usually reduce the potential of a pond because they reduce the space, oxygen and food available for the stock in the pond. To reduce losses due to diseases, parasite, predators and competitors, the aqua culturist should dry and treat the pond regularly, should supply good quality water and apply organic or inorganic pesticides, if the extra revenue generated can offset the cost involved.

Reduction in cost of producing and marketing : -

The major production costs in aquaculture are construction, feed and fertilizer, stocking materials, labour, water, marketing, interest rate and land lease. In many cases, the costs of the last three items are beyond the control of individual fish farmers. Factors affecting the price of each of these items will be discussed :

Cost of construction:

The primary considerations in site selection are topography, water supply and soil quality. The ideal location for a fishpond is on flat (or nearly flat) land. Lands with a slope greater than 5% are usually not suitable for fishpond because of high construction cost and erosion and siltation problems. Low soil permeability, constant availability of high quality water and easy access are also important factors in site selection. These factors affect not only the cost of construction but also the cost of operation. The size, shape and depth of the pond and the clearing work required also affect the cost of construction. Ponds can be of any shape but a rectangular one is probably the most convenient for harvesting. The depth of the pond depends mainly on the climatic condition and the species that are cultured. Economy of construction and operation, efficiency of operation and productivity of the pond are usually the primary factors in determining the size, shape and depth of a pond. Fishponds are usually constructed by excavating the total pond bottom. However, a substantial saving may be realized by constructing a ditch and dike kind of pond and by pumping water into the pond in order to culture certain species. The savings in construction may be more than enough to compensate the cost of pumping.

ii) Cost of feed and / or fertilizer :

Feed and/or fertilizer are probably the most important cost items for intensive aquaculture. Cost of feed per unit of fish production (C_f) depends primarily on two elements.

- The conversion ration of feed to flesh (R)
- The unit price of feed. (P_f)

it can be expressed as , $C_f = RP_f$.

The conversion ratio expresses the amount of feed necessary to produce a unit of fish. The cost of feed can be reduced by an improvement in the conversion ratio or by lowering the unit price of feed or by a combination of these two factors.

The economic principle of feeding is that the amount of feed should be at a level where the additional cost of feed equals its additional revenue. Amounts above this level would be a waste from an economic standpoint.

It would not be economically feasible to produce larger sizes if the increased cost of feed could not be off set by the increased unit price of a larger fish. Utilizing locally available materials or by- products for feed instead of imported feeds may lower the cost of feed.

To ascertain the right kind and amount of fertilizer to use, one should determine the fertility level of the soil in the bottom of the pond and the nutrient requirements of algae in the pond .It is easy to transport, store, and apply inorganic fertilizer .In many cases they are cheaper and as good as or better than, organic fertilizer. Again, domestic and farm wastes for fish culture often reduces the cost of feed and fertilizer. This practice has attracted wide attention as a means of recycling wastes, there by protecting the environment and at the same time contributing to food production. For instant, in India from Tilapia ponds irrigated with domestic sewage, production of more than 3 times the normal yield has been obtained (Sinka).

Further more, a simultaneous culture of fish and animal husbandry in many cases increases production of animal protein from the same unit area, reduces the cost of production (especially the cost of feed and/or fertilizer) and solves or reduces the problem manure disposal .For instant, Fish-Duck farming, reduced the cost of fish feed about 25% and produced about 100% more animal protein per unit of pond than from fish farming alone.

The amount of fertilizer applied should not cost more than the additional revenue it produces and the least cost combination of fertilizer occurs when the marginal rate of substitution equals the inverse ratio of the price of fertilizers.

The cost of land and pond construction is the major capital investments in pond fish farming and the cost of feed and/or fertilizer are the most important operating expenses. There fore, integrated fish farming is one of the alternatives that reduce these costs per unit of output.

iii) Cost of seed :

A reliable supply of good quality fish seed (fry, fingerling) obtained at a reasonable cost is one of the most important requirements for aquaculture. Expensive fry means a higher cost of production for fish, which either is transferred to consumers by higher prices or to the producers by reduced profits. The ultimate solution to the shortage of fry appears to be breeding these species in captivity. Meanwhile, short-range efforts should be made to increase the supply of fry by locating new spawning grounds, improving the survival rate during the pond-rearing period.

A further study revealed that the bigger the individual size of stocking material, the lower the cost of production per unit of market fish; consequently, the higher the profit (Leopold, 1978). Generally, large fish farms may benefit from their own hatcheries and small fish farms would benefit from central hatcheries operated either by government or by co- operatives

iv) Cost of labour

Efficient management and use of labour are essentials in reducing the cost of production. When capital is limited and family labour is relatively abundant which is true in many developing countries the operator should utilize labour as fully as possible.

Labour utilization might prove efficient for large farms. The labour requirements per unit of water area for large farms are usually lower than that for small farms. Additional labour is required for intensive culture because harvesting, feeding and stocking are done more frequently. However labor's requirements and hence labour costs per unit of output, may be relatively low.

v) Cost of water

An adequate supply of good quality water is essential for pond, raceway, cage and close system fish culture. In selecting sites for fresh water fish culture, effort should be made to locate the ponds in areas accessible to the water supply, which helps the recycling of water or interchange the water.

vi) Interest

The rate of interest varies with the supply of and demand for capital with the risks involved in an operation. Capital is regarded as a scarce resource in the rural areas of the developing countries. The risk involved in aquaculture are relatively high because of several factors-the limited knowledge about controlling diseases and parasites, predators, seed production, water pollution and flood damage.

Insurance is a way of spreading risks, but insurance for fish stocks is rather expensive because of the high risks involved

vii) Marketing cost

Marketing costs include preservation, processing, storage, transportation, commission and waste. Fish is a highly perishable commodity, there fore preservation is necessary if it is to be transported to distant areas.

With governmental support for improved transportation, storage and ice plants, marketing cost can be subsequently reduced; consequently, production either direct or indirect effect of higher profit d lease s for profits for producers can be increased.

viii) Land Lease :

The value or the rental price of land varies mainly with its quality and its alternative uses. In selecting a construction site for a pond, effort should be made to avoid choosing valuable lands that could have competing or conflicting uses. The leasing system is another factor affecting the rental price of land. Government interventions either by laws and regulations or by leasing public lands are suitable for aquaculture.

B) Increase in farm price :

In a competitive market, the price level is determined by the supply of and the demand for fish. The production of an individual fisheries farm is a small proportion of the total market supply and thus has a very limited influence on the market price i.e. the farm operators is a "price taker" the price received by individual fisheries operators can

be increased by the following way.

a) Improvement in the quality of fish :

Most of the production from fishponds Asian countries is sold while the fisheries are still fresh. Fish is a highly perishable product, especially in tropical climates low quality, spoilage, and waste reduce the average price that the farmers receive. However fish quality can be improved by preservation during transport and storage and careful handling during harvesting and by minimizing damage while transporting.

Fish farmers will benefit from preserving their products as long as the cost of preservation is less than the benefit they gain.

b) Seasonality :

The price of fishes usually fluctuates seasonally as a result of variations in the supply and demand. The demand for and price of fishes are usually high during the off-fishing season and the holidays associated with the local social customs. This practice is feasible only if the seasonal highs can be predicted and the costs associated with a change in production pattern are less than the gains in price received.

c) Co-operative Marketing and Different Markets and products :

The small-scale fish operators are usually in a weak bargaining position and often receive very low prices for their product. The situation may be improved through collective bargaining by fisheries pond operators associations or co-operatives. A regulated and stored supply of fish means greater stability in price and on the average higher prices. Wasted time and unnecessary transportation costs can also be eliminated. Further more, allocating fish to different markets and selling them in different forms (fresh, frozen, salted, smoked etc.) may also increase the average price and maximizing revenue.

Basic principle of production economics Applied to aquaculture :

As previously mentioned in this chapter, profit maximization of individual commercial aquaculture operation can be achieved by one of two related ways,

1. By maximizing production with given resources or in monetary terms, maximizing production revenue at a given production cost.
2. By achieving a given level of production with least possible resources; or, in monetary terms, by achieving a given production revenue at the least possible cost.

The production function, termed as product factor relationship or input output relationship, expresses the physical or biotechnical relationship between outputs and inputs .It can be expressed algebraically as.

$$Q = f(x_1, x_2, \text{————} x_n)$$

Q—quantity of output (dependent on input)

x_1, x_2 ———quantity of input .

In aquaculture, the total production of a particular species per unit of area is usually dependent upon input levels for labour, capital, feed, fertilizer fry etc. and non market environmental factors such as water temperature, dissolved oxygen, salinity, pH value etc.

Again it is important to note that input -output relationships are meaningful only if

a) Input and outputs are homogeneous.
b) Function refers to a specific period of time and a single technique.
c) The inputs are used efficiently.

The marginal physical product of a particular input (MPP_{x1}) is defined as the change in total output resulting from a unit change of a particular input when all other inputs are held constant. Expressed as.

$$MPP_{x1} = \frac{DQ}{DX1}, \text{ Where D means change}$$

Therefore, marginal concept is very important in production function analysis. Again for short run analysis (like farm) the law of diminishing marginal returns is also considered. The law of diminishing marginal returns states that as the quantity of one input is increased, while the quantity of input is increased, while the quantity of another input is held constant, a point will be reached beyond which additional (marginal) units of input will add less and less to output. In other words, with one fixed and other variable input, a point will be reached beyond which MP must decline; eventually falling below the average .The curve must have a declining portion. They may increase at first and then decline, as shown in figure-25. 1 or they may begin to decline from the start, but they must decline at some point.

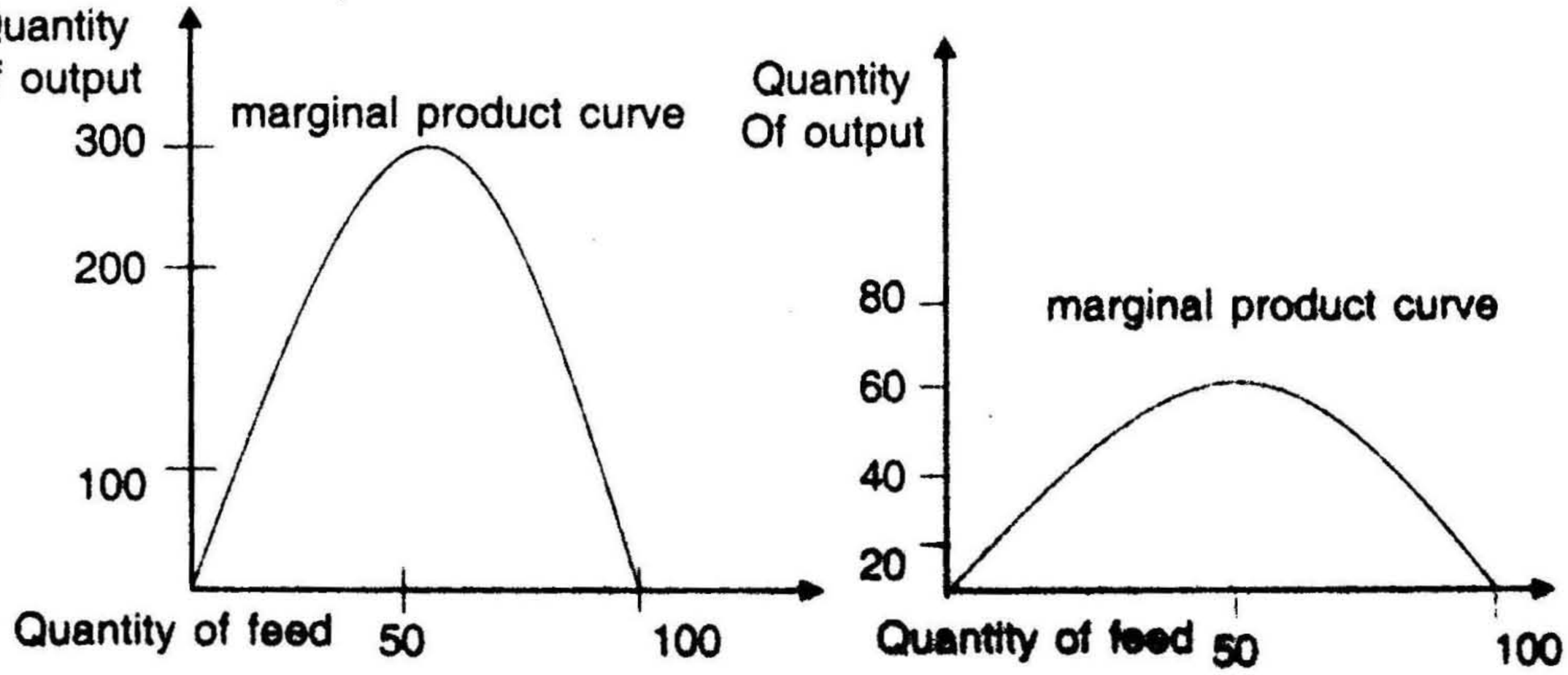


Fig 25.1: Major factors affecting the economics of agriculture

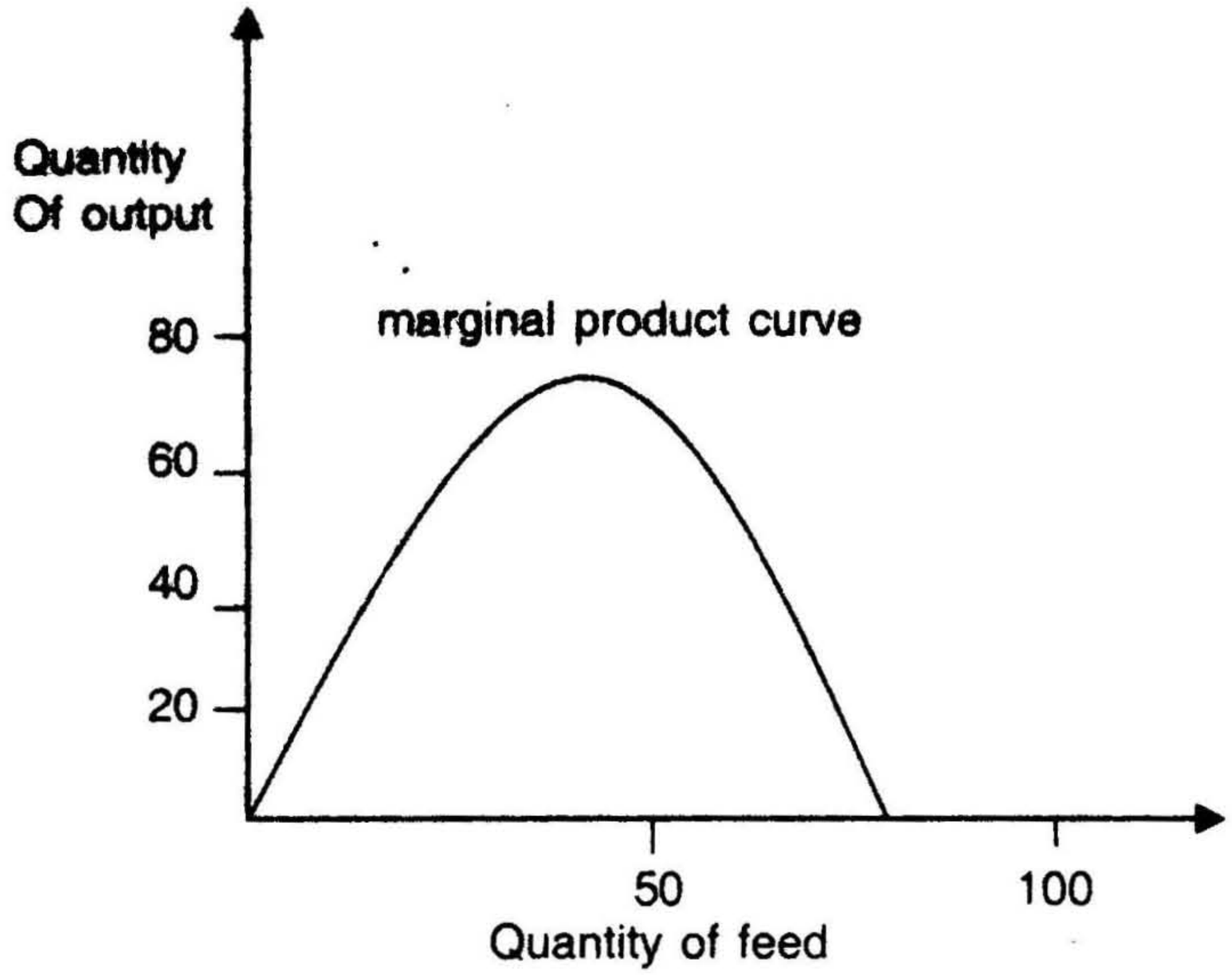


Fig 25.2: Hypothetical aph of total, average and marginal products.

Maximum level of input :

Given a production function, the cost of inputs and the price of outputs must be considered in determining the most profitable level of inputs. Profit are maximized if the marginal value product of that inputs equals to marginal input cost (MIC)

$$MVP = MICx_1$$

$$MVP_{x1} = \frac{DQ}{D_{x1}} \quad (Pq) \text{ and } MIC_{x1} = P_{x1}$$

Where, Pq = price of output

P_{x1}= price of input

Therefore, the maximization condition of the application of a simple variable x_1 with the level of other input unchanged can also be written as -

$$\frac{DQ}{D_{x1}} (Pq) = P_{x1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Or $DQ.\ Pq = D_{x1.}\ P_{x1}$, or $MVP_{x1} = P_{x1}$

From (1) we may also written as $$\frac{DQ}{D_{X1}} = \frac{P_{x1}}{Pq}$$

$$\text{Or } MPP_{x1} = \frac{P_{x1}}{Pq}$$

From the following table (T.no 25.1) it is seen that, the profit is highest at the sixth unit of input. The marginal value product exceeds the marginal cost of those input levels by less than six units, which indicates that the producer will benefit by using additional unit of inputs. On the other hand, the added cost are greater than the added returns when more than six units of x1 are used.

The conditions for profit maximization mentioned above indicate that there are three major factors affecting the most profitable level of inputs. These are -

a) Price of output (Pq)

b) Price of the input (P_{x1})

c) The physical production relationship as it affects the marginal physical product (DQ/ D_{X1})

Table 25.1: Hypothetical Relationship Between Input and Output :

Unit of input (X_1)	Total input $(TC)x_1px_1$	Marginal Input cost MIC= DTC/DX_1	Total output (Q)	Marginal product (MP) $=DQ/DX_1$	Total value product TR=Q.Pq	Marginal value product MVP=MP.Pq	Profit (TR-TC)
0	0	-	0	-	0	-	O
1	2	2	5	5	10	10	8
2	4	2	12	7	24	14	20
3	6	2	21	9	42	18	36
4	8	2	31	10	62	20	54
5	10	2	39	8	78	16	68
6	12	2	42	3	84	6	72
7	14	2	41	-1	82	-2	68
8	16	2	38	-3	76	-6	60

Maximum level of production :

The maximum level of production depends upon the cost of production and the revenue. Profit is maximized when the increase in total costs resulting from a one-unit increase in output equals the corresponding increase in total revenue. In other words, profit will be maximized when marginal cost (MC) equals marginal revenue (MR).

Table 25.2 : Hypothetical relationship between Revenue and Cost.

Output	Total revenue	Change revenue	Marginal revenue	Total	Change in cost	Marginal cost	Profit
5	10	-	-	8	-	-	2
10	20	10	2	10	2	0.4	10
15	30	10	2	13	3	0.6	17
20	40	10	2	17	4	0.8	23
25	50	10	2	24	7	1.4	26
30	60	10	2	40	16	3.2	20
35	70	10	2	60	20	4.0	10
40	80	10	2	85	25	5.0	-5

Example of the revenues and costs to be considered in making production decision are illustrated in above table no 25.2. Profit is highest when 25 units are produced. At this level to production the marginal cost is less than the marginal revenue but the former exceeds the latter when 30 units are produced.

A decline in output price reduces the marginal revenue and hence, the optimum level of output. On the other hand, an increase in output price increase the marginal revenue and the most profitable level of output. Change in input price cause changes in production in the opposite direction corresponding to those changes in output prices.

inputs

Least – cost combination of Input:

A producer must choose the particular combination of inputs that minimizes costs. A given level of production may be produced by various combination of inputs. To A certain degree the following inputs may be substituted in aquaculture. Labour and capital; feed and water surface (less feed versus low stocking rate and extended pond area, or *vice-versa*); fertilizer and water surface (more fertilizer versus high stocking rate and less pond area, or *vice- versa*); different kinds of feed; or different kinds of fertilizer.

Now we may start with the simplest case: Two variable inputs with a production function of the form

$$Q = f\left(\frac{X_1, X_2}{X_3 \ldots X_n}\right)$$

That is, production depends on the amount of x_1 and x_2 used while the other inputs are held constant at a particular level. If x_1 and x_2 are substitutable, the rate of substitution indicates the amount by which one input must be changed to offset a change in the amount of other input, there by maintaining production at a particular level. This is commonly defined as the marginal rate of substitution (MRS_2) between inputs (which is almost always negative), or in algebraic forms,

$$MRS_2 = \frac{DX_2}{DX_1}$$

Where Dx_2 and Dx_1 are the changes in the two marginal inputs required to maintain a constant level of output. This MRS_2 cannot determine the least - cost combination of inputs. The least- cost combination of two inputs required to produce a given level of output occurs when the marginal rates of substitution equals the inverse ratio of marginal input prices,

$$DX_2/DX_1 = PX_1 /PX_2$$

$$\text{Or} \quad PX_2\, DX_2 = PX_1 DX_1 ,$$

It means that the cost of change in X_2 is equal to the cost of change in X_1. If $PX_2\, DX_2 > PX_1 DX_1$, then using more X_1 and less X_2 will decrease cost, on the other hand, if $PX_2\, DX_2 < PX_1 DX_1$, then using more X_2 and less X_1 , will decrease cost in producing a given level of output.

In table no 25.3 : X_1 and X_2 are combined to produce a given level of output. Since X_1 costs twice as much as X_2, the ratio of PX_1 / PX_2 is 2:1. There fore, the least cost combination would be 10 units of X_1 and 15 units of X_2 where, DX_2 / DX_1 = PX_1 / PX_2 = 2:1.

Table no 25.3 : Hypothetical relationship of combination of two inputs for a given level of output

(PX_1 =Rs.10; PX_2 =Rs. 5)

Table 25.3

X_1	X_2	DX_2 / DX_1	Cost (Rs.)
0	40	—	200
5	25	3.0	175
10	15	2.0	175
15	8	1.4	190
20	3	1.0	215
25	0	0.6	250

A change in the relative prices of X_1 and X_2 change the least- cost combination. A producer can determine the least- cost combination of inputs when the marginal rate of substitution equals the inverse ratio of new input prices.

Combination of products :

Product- product relation's deals with the questions of what kinds of aqua cultural products should be produced with the limited resources available to the farmer. Should milkfish and/or shrimp be produced, and should fingerlings and/ or table fish be reared etc. One must choose which products are possible or desirable to produce .Two products are completive if an increase in the in one product result in a decrease in the other. A supplementary relationship exists between two products if an increase in the production of one product does not affect the production of the other. They are termed complementary when one product contributes to the production of the other.

The term marginal rate of substitution (MRS_p) has the same meaning for the product - product relationship as for the input-input relationship. If refers to the absolute change in one product associated with a change of one in a competing product, or in algebraic terms-

$$MRS_P = DQ_A / DQ_B$$

The products are competitive or supplementary or complementary if the marginal rate of substitution is less than zero, equal to zero or greater than zero, respective, as shown in Table no25.4.

The profit maximizing combination of two products with given resources is achieved when the marginal rate of substitution equals the inverse of the ratio of their prices.

$$DQ_A / DQ_B = P_B / P_A$$

$$\text{or} \quad P_A DQ_A = P_B DQ$$

If $P_A DQ_A > P_B DQ_B$ more input should be used to produce Q_A , and less Q_B should be produced .On the other hand , if $P_A DQ_A < P_B DQ_B$ it is profitable to produce more Q_B

Table no 25.4 : Hypothetical relationship of combination of two products with a given level of inputs.

Species A (kg)	Species B (kg)	MRS (DQ_A/DQ_B)	Product Relationship
3000	0	+ 1.00	Complementary
3300	300	0	Supplementary
3300	600	- 0.75	Competitive
3000	1000	- 1.25	Do
2500	1400	- 2.33	Do
1800	1700	- 3.33	Do
800	2000		Do

From the above table, if P_A is 30.00 / kg and P_B is 22.50 /kg, the best combination of species A and species B would be occur when,

$$DQ_A/DQ_B = P_B / P_A = 22.50 / 30.00 = 0.75$$

Which is 3000kg of species and 100kg of species B in Table no25.4 . The gross revenue is highest with this combination, because we are assuming a given amount of inputs whose prices are known, the maximum gross revenue will correspond to the maximum profits.

Farm Size

In the long run the producers can vary all inputs. When output of a farm increases, average costs of production tend to decline in the beginning as fixed costs are spread more units and as resources or used more efficiently. When output is increased to a level where some resources become limiting factors, cost of production will eventually rise as the law of diminishing returns prevails .The size of a farm should be expanded in such a way that -

a) The marginal value product for any resource equals the unit price of that resource.

b) This ratio must be equal, among all resources (Heady)

$$MVPX_1 / PX_1 = MVPX_2 / PX_2 = \text{————————} = MVPX_N / PX_N$$

Conclusion :

Production functions derived from cross-section data collected from sample farms under varying conditions during a given period of time are referred to as cross-sectional production fuctions. The same basic economic principles mentioned earlier apply to cross sectional production functions; and marginal product, elasticity of production, marginal rate of substitution returns to scale etc.can be derived from the function. However, this kind of production function is not a very useful guide to decision making for individual farmers unless the functions are relatively disaggregated both in inputs and outputs and the sample are refined (Heady and Dillon,1964).They may be more meaningful guides to policies involving the allocation of resources among the regions or between industries.

CHAPTER - XXVI
THE WORLD TRADE ORGANISATION

Introduction

In 1947, the United Nations formulated the General Agreement on Tariffs and Trade [GATT] in an attempt to alleviate the barriers that were impeding world trade. The aim of GATT was to achieve a world trading system based on non-discrimination through the fair, full and free exchange of goods and services. Much was achieved under GATT by way of lowering tariffs, eliminating quotas and licensing requirements, and providing the first legal framework for the conduct of international trade.

In 1986, governments of the world began a review of the GATT with a view to modifying it to provide more appropriately for changes in trading behaviour and practices that had taken place since its inception. The review, launched at Punta del Este, Uruguay, became known as the Uruguay Round [UR]. After nearly eight years of multilateral negotiations, UR concluded with the Final Act signed at Marrakech, Morocco during 1994 by ministers of 125 participating countries. This Final Act or the Marrakech Act established the World Trade Organisation. Thus, in brief, the WTO is an international organisation set up to deal with the global rules of trade between nations.

Functions of WTO

The WTO's overriding objective is to help trade flow smoothly, freely, fairly, and predictably. It does this by:

- Administering trade agreements
- Acting as forum for trade negotiations
- Settling trade disputes
- Reviewing national trade policies
- Assisting developing countries in trade policy issues, through technical assistance and training programmes
- Cooperating with other international organisations.

Structure

With the inclusion of China and Taiwan into the WTO on 17th September 2001 at the Doha Conference, Qatar, there are at present 144 members. The structure of the WTO is as follows:

The WTO's top-level decision-making body is the Ministerial Conference, which meets at least once every two years.

Below this is the General Council [normally ambassadors and heads of delegations in Geneva, but sometimes officials sent from members' capitals], which meets several

times a year in the Geneva head quarters. The General Council also meets as the Trade Policy Review Body and the Dispute Settlement Body.

At the next level, the Goods Council, Services Council and Intellectual Property [TRIPS] Council reports to the General Council.

Numerous specialized committees, working groups and working parties deal with the individual agreements and other areas such as environment, development, membership applications and regional trade agreements.

Secretariat

The WTO Secretariat, based in Geneva, has around 500 staff and is headed by the director-general. It does not have branch offices outside Geneva. Since the members themselves take decisions, the Secretariat does not have the decision-making role that other international bureaucracies are given. The Secretariat's main duties are to supply technical support for the various councils and committees and the ministerial conferences, to provide technical assistance for the developing countries, to analyze world trade, and to explain WTO affairs to the public and media. The Secretariat also provides some form of legal assistance in the dispute settlement process and advices governments wishing to become members of WTO.

WTO Agreements

The WTO's rules-the agreements are the result of negotiations between the members. The current set were the outcome of the 1986-94 Uruguay Round negotiations, which included a major revision of the original General Agreement on Tariffs and Trade [GATT]. GATT is now the WTO's principal rulebook for trade in goods. The UR also created new rules for dealing with trade in services, relevant aspects of intellectual property, dispute settlement and trade policy reviews. Through these agreements, the members operate a non-discriminatory trading system that spells out their rights and obligations. Each country receives a guarantee that its exports will be treated fairly and consistently in other countries markets. Each promises to do the same for imports. The system also gives developing countries some flexibility in implementing their commitments.

The WTO's Agreements can be classified under three main heads :

1. **Agreement on Trade-Related Investment Measures [TRIMs]**

   This agreement deals with trade in goods. The updated GATT is now the WTO's principal rulebook for trade in goods. It has annexes dealing with specific sectors such as agriculture [which includes fisheries] and textiles, and with specific issues such as state trading, product standards, subsidies and actions taken against dumping.

2. **General Agreement on Trade In Services [GATS]**

This agreement covers areas such as banking, insurance, telecommunication and other areas like tourism, hotel chains, transport companies etc.

3. Agreement on Trade Related Aspects of Intellectual Property Rights [TRIPs]

Intellectual Property refers to the creations of the human mind such as works of art, fiction, design, any embodiment of intellectual effort and creativity in the field of applied arts, fine art or technology. The expression of an idea is intellectual property. It is a package of rights that can be bought or sold or leased. The TRIPs Agreement covers seven aspects of intellectual property namely, Copyright and related rights; Trademarks; Geographical indications; Industrial Designs; Integrated circuits; Trade secrets and Patents [which includes plant varieties].

Agreement on Agriculture

Of the above three agreements the Agreement on Agriculture, which is a part of TRIMs, is of concern to us as it also includes fisheries.

The objective of the AoA is to reform trade in the sector and to make policies more market-oriented so as to provide security for importing and exporting countries alike. The original GATT included trading in agricultural produce also, but it did not facilitate in providing a distortion free trade between the nations. It allowed countries to use non-tariff measures like import quotas for restricting imports and export subsidies as incentives to the farmers to boost exports. The products included within the purview of this agreement are those that are normally considered as part of agriculture but exclude fishery, forestry products, rubber, jute, sisal, coir and abaca (Manila hemp). The AoA is effective from 1.1.1995 and as per its provisions the developed countries would complete their reduction commitments within 6 years, i.e., by the year 2000, whereas the commitments of the developing countries would be completed within 10 years, i.e., by the year 2004. The least developed countries are not required to make any reductions.

The commitments made by the negotiating nations are in respect of providing market access and in removing restrictions like tariffs and tariff quotas; extent of domestic support in the form of subsidies and other programmes, including those that raise or guarantee farm-gate prices and farmers' incomes and reducing export subsidies and other incentives used to make exports artificially competitive.

a. Market access :

Prior to the Uruguay Round, quotas and other non-tariff measures restricted imports of some of the agricultural commodities. These have been replaced by tariffs that provide similar levels of protection. Member countries are expected to convert the quotas and other types of measures to tariffs through the process of "tariffication". Tariffication

means that all non-tariff barriers such as quotas, variable levies, minimum import prices, discretionary licensing, state trading measures, voluntary restraint agreements, etc., need to be abolished and converted into an equivalent tariff. With regard to food [including fishery] products, non-tariff barriers may include various Sanitary and Phytosanitary [SPS] Measures, Technical Barriers to Trade etc., which will be discussed later. The Agreement also ensured that quantities imported before the agreement took effect could continue to be imported and guaranteed that some new quantities were not charged prohibitive duty rates. This was achieved by a system of "tariff-quotas". The new rule for market access in agricultural products is "tariffs only".

The newly committed tariffs and tariff quotas, covering all agricultural products, took effect in 1995. Member countries agreed that developed countries would cut the tariffs (the higher out-of-quota rates in the case of tariff-quotas) by an average of 36%, in equal steps over six years. Developing countries would make 24% cuts over 10 years.

It has also been stipulated that minimum market access equal to 3% of domestic consumption in 1986-88 will have to be established for the year 1995 rising to 5% at the end of the implementation period. India did not have to undertake any commitments in regard to market access as it was maintaining Quantitative Restrictions due to reasons of adverse balance of payments (which is a GATT consistent measure).

Table : Commitments by Member Countries under AoA

Particulars	Developed Countries	Developing Countries
Period of Commitment	6 years: 1995–2000	10 years: 1995–2004
Tariffs		
Average cut for all agricultural products	–36%	–24%
Minimum cut per product	–15%	–10%
Domestic Support		
Total AMS cuts for sector		
(Base period: 1986-88)	–20%	–13.3%
Market Access	3-5%	3-5%
Export Subsidies		
Value of subsidies	–36%	–24%
Subsidized quantities		
(Base period: 1986–90)	–21%	–14%

Quantitative restrictions

With regard to market access, one important aspect is that of quantitative restrictions [QRs]. Quantitative restrictions are specific limits on the quantity or value of goods that can be exported or imported during a specific time period. Quantitative restrictions are prohibited under GATT disciplines [Article XI], although exemptions are allowed under Articles XVIII, XX, and XXI. These exceptional rules permit the imposition of quantitative measures under limited conditions and only if they are taken under policy grounds justifiable under the GATT such as critical shortage of food stuffs (Article XI: 2) and Balance of payment (Article XVIII: B).

Developing countries like India were permitted to maintain Quantitative restrictions (QRs) due to Balance of payment (Bop) position and initially committed to phasing out the QRs in a phased manner by the year 2003. Accordingly, India had been maintaining QRs on imports of 825 agricultural products as on 1st April 1997. However, U.S.A. had filed a case in the WTO Dispute Settlement Body (DSB) against these QRs in May 1997. The DSB had ruled against India and as a result India agreed to remove QRs for 1429 items by March 2001: 715 by March 2000 and 714 items by March 2001. Much of the mainstream media in India have enthusiastically welcomed the removal of quantitative restrictions (QRs) on imports with respect to 714 items, the centerpiece of the Exim Policy announced on March 31 by Union Minister for Commerce and Industry. Commodities such as fish and fishery products figure prominently on the list of items that can now be imported freely and such a step is going to have a profound impact on the Fisheries sector.

List of Items

1) Live, Chilled and Frozen fish
2) Crustaceans in shell, live, fresh, chilled, frozen, dried, salted, cooked etc.
3) Molluscan in shell, live, fresh, chilled, frozen, dried, salted, cooked etc

What will be the effects of the removal of these QRs on the Indian fishing industry?

Fish exporters have welcomed the Exim Policy. In all, there are 258 freezing units with capacity of 2170 tonnes, 23 canning units with a capacity of 84.5 tonnes, 131 ice making units with a capacity of 1820 tonnes, 24 fish meal units with a capacity of 419 tonnes and 297 cold storage units with a capacity of 20,3448 tonnes. This sector has also attracted the attention of investors both domestic and foreign and an investment as high as Rs.30, 000 million has been approved in the last six years of which foreign investment was around Rs.7000 million. The infrastructure facility has been considerably enhanced after the European Union ban on Indian seafood. But the economic viability of this industry is still in doldrums. Industry observers' points out that they are operating with

substantial excess capacities; capacity utilization is now only 20-25 %. Capacity utilization depends on the raw material supply. The Indian seafood factories, which are mostly idle during the monsoon season due to trawl ban, can process imported raw material in the changed scenario. Due to the low capacity utilization, seafood has become a low profit industry. This has lead to a complete lack of foreign investment and therefore to latest developments, which are inherent, the foreign joint ventures.

The industry will mature only when value added products are exported rather than semi-finished raw material for value addition in the import countries. Value added products would bring in more income than export of raw material. The new policy would enable the export of tuna. Since tuna prices are high in the Indian market, exporters do not enjoy a comfortable margin. The situation will change dramatically once cheaper tuna is imported into the country.

The significance of international trade in fish and fish products is further enhanced by the fact that the net foreign exchange earning from seafood exports is one of the highest in India. However, tariff and non-tariff barriers hamper the access to international markets for the fish workers from the artisanal sector. The tariffs imposed on the export of processed fish and shellfish to discourage landing, processing and exporting from developing countries where the fish is actually harvested, deprives developing countries of enhancing employment opportunities in the labour-intensive fish processing industry; this deprives crucial employment and income opportunities in the coastal areas.

But the fishermen fear that large-scale import will affect the domestic fishing industry. But there is very little chance of this happening due to the fact that the frozen seafood import freight is more than the price of the fish in the local market, the imported varieties are cold water species which are not relished by the Indian consumers and there is no cold chain distribution system in India for supplying the imported product in the Indian market.

US based Red Chamber, the largest importer of Indian seafood, is aiming to shift its reprocessing base from China to India with an investment of $ 1.3 billion directly in areas like marine product procurement, processing and value addition. Japan is also keen on tie-ups in this sector. This is a welcoming sign. Such collaborations will generate more employment in pre-processing facilities and factories and also bring about a general up gradation in qualitative standards, as foreign buyers will monitor production under their supervision.

Millions of fisher folk and fish workers are the mainstay of the fish economy of India. In the budget of 2000-01, Government of India has announced 35 per cent tariff rate for most of the items on which QRs have been removed including fish and fishery

products. It is difficult to believe that 35 percent is the tariff equivalence for all the items for which QRs have been removed. Now tariff rates will be the only instrument for India's trade policy. Government of India should judiciously use the tariff rates to protect the domestic industry.

b. Domestic Support

The issue of containing domestic support to the agricultural sector has been triggered mainly because developed countries like US, Japan and member countries of the European Union have been heavily subsidizing their farmers in order to have price advantage and thus gain a larger share of the international trade. It is the case with fisheries. Most of the fish workers in India are in the artisanal sector and are dependent on fisheries for their life and livelihood. The artisanal sector is often at a disadvantage because of its inability to compete with the subsidized fleets of large-scale fisheries, which are in a better position to sell at a cheaper price in the international market. [Reduction in domestic support by developed countries will be beneficial for developing countries, as they'll be in a better position to compete with them].

The provisions under AoA seek to remove such distortions and strive for a level playing field in international trade. The Agreement spells out two types of subsidies, i.e., Non-Product Specific Subsidies and Product Specific Subsidies. Non-product specific subsidies are being provided for fertilizers, irrigation, pesticides and credit that are available for all crops, i.e., input subsidies. Reduction commitments refer to total levels of support and not to individual commodities.

Domestic policies that do have a direct effect on production and trade have to be cut back. Domestic support measures that have, at most, a minimal impact on trade are excluded from reduction commitments. Such policies, termed as "green box" policies, include general government services, for example in the areas of research, disease control, infrastructure [like those given by MPEDA to export units in our country] and food security. "Blue box" measures which include direct payments to producers, for example certain forms of "decoupled" (from production) income support, structural adjustment assistance, direct payments under environmental programmes and under regional assistance programmes are also exempt.. Also included in the "Blue box" list are certain direct payments to farmers where the farmers are required to limit production, certain government assistance programmes, for e.g. through resource retirement programmes, producer retirement programmes, government financial participation in income insurance and income safety net programmes [these relate solely to income and not to either the level of production or to the prices, domestic or international] to encourage agricultural and rural development in developing countries, and other support on a small scale when

compared with the total value of the product or products supported (5% or less in the case of developed countries and 10% or less for developing countries).

The extent of subsidies a country can give to its farm sector is calculated through Aggregate Measure of Support (AMS). The Total AMS covers all support provided on either a product-specific or non-product-specific basis that does not qualify for exemption. The Agreement does not envisage any reduction in the level of subsidies if the total amount on account of such subsidies is lower than 10 per cent of the total value of agricultural output during the period between 1986 and 1989. The Total AMS covers all support provided on either a product-specific or non-product-specific basis that does not qualify for exemption and is to be reduced by 20 per cent over six years, starting from 1995, by developed countries and by 13.3 per cent over ten years by developing countries. The least developed countries have no reduction commitments.

Special and Differential Treatment provisions are also available for developing country members. These include purchases for and sales from food security stocks at administered prices provided that the subsidy to producers is included in calculation of AMS. Developing countries are permitted targeted subsidized food distribution to meet requirements of the urban and rural poor. Also excluded for developing countries are investment subsidies that are generally available to agriculture and agricultural input subsidies generally available to low income and resource poor farmers in these countries.

India does not provide any product specific support other than market price support. During the reference period (1986-88), India had market price support programmes for 22 products, out of which 19 are included in our list of commitments. The products are - rice, wheat, bajra, jawar, maize, barley, gram, groundnut, rapeseed, toria, cotton, soyabean (yellow), soyabean (black), urad, moong, tur, tobacco, jute, and sugarcane. The total product specific AMS was (-) Rs.24,442 crores during the base period. The negative figure arises from the fact that during the base period, except for tobacco and sugarcane, international prices of all products were higher than domestic prices, and the product specific AMS is to be calculated by subtracting the domestic price from the international price and then multiplying the resultant figure by the quantity of production.

Non-product specific subsidy is calculated by taking into account subsidies given for fertilizers, water, seeds, credit, and electricity. During the reference period, the total non-product specific AMS was Rs.4581 crores. Taking both product specific and non-product specific AMS into account, the total AMS was (-) Rs.19, 869 crores i.e., about (-) 18% of the value of total agricultural output.

Since our total AMS is negative and that too by a huge magnitude, the question of our undertaking reduction commitments did not arise. The calculations for the marketing

year 1995-96 show the product specific AMS figure as (-) 38.47% and non-product specific AMS as 7.52% of the total value of production. We can further deduct from these calculations the domestic support extended to low income and resource poor farmers provided under Article 6 of the Agreement on Agriculture. This still keeps our aggregate AMS below the *de minimis* level of 10%.

c. Export Subsidies

The AoA prohibits export subsidies on agricultural products unless the subsidies are specified in a member's lists of commitments. Where they are listed, the agreement requires WTO members to cut both the amount of money they spend on export subsidies and the quantities of exports that receive subsidies. Taking averages for 1986-90 as the base level, developed countries have agreed to cut the value of export subsidies by 36% over the six years starting in 1995 (24% over 10 years for developing countries). Developing countries have also agreed to reduce the quantities of subsidized exports by 21% over the six years (14% over 10 years for developing countries). Least developed countries do not need to make any cuts.

During the six-year implementation period, developing countries are allowed to use subsidies to reduce the costs of marketing and transporting exports under certain conditions. Where subsidised exports have increased since the 1986-90 base period, 1991-92 may be used as the beginning point of reductions in certain circumstances although the end-point remains the same. The Agreement on Agriculture provides for some limited flexibility between years in terms of export subsidy reduction commitments and contains provisions aimed at preventing the circumvention of the export subsidy commitments and sets out criteria for food aid donations and the use of export credits.

In India, exporters of agricultural commodities do not get any direct subsidy. The only subsidies available to them are in the form of (a) exemption of export profit from income tax under section 80-HHC of the Income Tax Act and this is also not one of the listed subsidies as the entire income from Agriculture is exempt from Income Tax *per se* and (b) subsidies on cost of freight on export shipments of certain products like fruits, vegetables and floricultural products. In the schedule of commitments, India has indicated that it reserves the right to take recourse to subsidies (such as cash compensatory support) during the implementation period.

Agreement on Sanitary and Phytosanitary Measures

SPS measures are those whose application is associated with the protection of human, animal and plant health.

Surveys have disclosed that internationally, concerns about food hazards are mainly related to:

- Food-borne diseases resulting from microbial [Salmonella, *Listeria, Shigella, E. coli*, etc.] contamination.
- Residues of pesticides and veterinary drugs [organochlorines, sulpha drugs, antibiotics, etc.]
- Environmental contaminants [dioxins, cadmium, lead, mercury, zinc etc.].
- Food additives-especially those to which significant numbers of consumers are hypersensitive.
- Radioactive contamination.

Also included in this agreement are aspects related to conservation for e.g., the case of turtles.

The agreement recognises that governments have the right to take sanitary and phytosanitary measures, but emphasises that they should not arbitrarily or unjustifiably discriminate between Members. Conversely, governments of exporting countries are expected to respect the justifiable food safety related standards adopted by importing countries and take steps necessary to ensure that their food exports comply with them. In order to harmonize sanitary and phytosanitary measures on as wide a basis as possible, member countries are encouraged to base their measures on international standards, guidelines and recommendations where they exist [The WTO recommends the Codex Alimentarius Standards, Guidelines and Recommendations. They may, however, maintain or introduce measures, which result in higher standards if there is scientific justification or as a consequence of consistent risk decisions based on an appropriate risk assessment.

In order to ensure that the adoption of a new SPS regulation does not cause barriers to trade, the agreement provides for a reasonable interval between its publication and its entry into force and further provides "longer time-frames for compliance" for developing countries. The basic purpose of these provisions is to provide sufficient time to producers in developing countries to adopt their products to the requirements of new regulations.

Many countries are setting their health standards at a level higher than the internationally prescribed one. For example, the setting of pesticide residue limits that are unnecessarily stringent, prohibiting the use of substances in food production [for e.g., growth promotants] that have been shown scientifically to be harmless if used correctly; and demanding evidence from harmful substances where there is no risk of their presence [for e.g., testing for radionucleides in food from regions of normal radioactivity]

Another instance is shrimps' export from India. The USA had placed restriction on the ground that these are not caught with turtle excluding devices. An appeal was placed against this in the WTO Appellate Body. However on June 15, 2001, the court

ruled that the US could maintain the ban for the moment. At the same time, it pointed out that the ban could be justified as long as the US officials kept up serious good faith efforts to reach an international agreement on turtle conservation. The developing countries are of a view that the ban was aimed at protecting the US shrimp industry from competition.

India has taken a position that arbitrary as well as restrictive sanitary and phytosanitary measures continue to represent a major obstacle to international trade of agricultural products. Developing-country exports are usually affected because the SPS measures are often developed in a non-transparent manner and developing countries invariably do not get adequate opportunity to respond to the proposed measures. A number of international standards are thus being developed without the participation of developing countries. As a result, standards are often being adopted without taking into account the problems and constraints that developing countries face.

Agreement on Technical Barriers to Trade [TBT]

The objective of the Agreement on Technical Barriers to Trade is to prevent the use of national or regional technical requirements, or standards in general, as unjustified technical barriers to trade. It covers all types of standards including aspects of food standards except those requirements related to Sanitary and Phytosanitary measures and include a very large number of measures designed to protect the consumer against deception and economic fraud. The aspects of food standards it covers relate specifically to quality provisions, nutritional requirements, labeling, and methods of analysis. The Agreement provides that all technical standards and regulations must have a legitimate purpose.

It is noteworthy that both SPS and TBT Agreements acknowledge the importance of harmonizing standards internationally if the risk of sanitary, phytosanitary and other technical standards becoming barriers to trade is to be minimized or eliminated.

Important terms and concepts

Balance of payments:

The balance of payment of a country refers to the balance between the payments that are owed to the outside world and that are owed by the outsiders to the country. It is a recording of the value of transactions across borders and comparison of into-the-country transactions with outgoings. A table can be drawn to judge the balance of payments to a country. One column of the table will show the credit side, i.e., the incoming foreign exchange. It will include payments for goods and services exported to other countries, foreign corporations bringing money to invest, loans etc. The second column will show the foreign exchange going out, the debit side. It will include the payments for imports, payment of loans or interest of loans, profits of foreign companies sent back to their

parent countries and so on.

Reading the Balance of Payments table gives an idea of what it is that is contributing to a nation's capacity to earn foreign exchange and what constitutes a drain on foreign exchange.

Anti Dumping

Selling goods in a foreign country at a price which local producers regard as unfairly low. This may mean selling at less than the long-run average costs; charging a lower price in export markets; or simply selling at a price with which producers in the importing country cannot compete. This is an unfair trade practice, which can have a distortive effect on world trade. Anti Dumping is a measure to rectify the situation arising out of the dumping of goods and its trade distortive effect. The use of Anti-Dumping measure as an instrument of fair competition is permitted by the WTO. In fact, Anti-Dumping is an instrument for ensuring free trade and is not a measure of protection per se for the domestic industry. It provides relief to the domestic industry against the injury caused by dumping.

Tariffs

A tariff [or duty] is a tax levied on imports and, less often, on exports as they cross the borders into other countries. A specific tariff is imposed on each unit of an imported good; and valorem tariff is levied as a percentage on the price of the good to the importer. Both modes result in higher prices to domestic purchasers as the duty is passed forward on resale.

Quotas

A quota, in international trade is a type of barrier that nations place on the physical amount of imports or exports of specific kinds of goods. A quota differs from a tariff, which is a schedule of taxes or duties placed on imports that does not categorically place limitations on the amount of goods that may be imported. Both tariffs and quotas are seen as detrimental to the concept of free trade, and the WTO works to reduce such trade barriers.

Tariff Quota

A quota that allows for import of a commodity at less than the general applied rate [for e.g., a country applies a general tariff of 100% on a particular commodity and then allows a limited quantity, say 20,000 tonnes, to be imported at a lower rate of 20%.

Most Favoured Nation [MFN] status

The Most Favoured Nation [MFN] status is a provision in a commercial treaty whereby any advantage, favour, privilege or immunity granted by a member to the nationals of any other country shall be accorded immediately and unconditionally to the nationals

of all other members. All nations belonging to the GATT have agreed to the most favoured-nation principle as a condition of membership.

Trade Arrangements and Trade Blocs

An important aftermath of the Uruguay Round was the formation of trade blocs and trade arrangements among countries. While regional groupings among the developing countries have the noble objective of promoting development by proper exploitation of potential complimentaries and neighbourhood advantages, the trading blocs among the developed countries have the objective of strengthening and expanding their hold in the world economic trade and development. These trade blocs take different forms according to the degree and intensity of cooperation among the member countries. There are currently about 15 regional trade arrangements ranging from the European Union [EU] and North American Free Trade Arrangement [NAFTA] to preferential arrangements such as the South Asian Preferential Arrangement [SAPTA]

Conclusion

The Agreements reached under the Uruguay Round of GATT negotiations are designed to minimize the distortions in international trade and seek to provide a level playing field between the trading partners. With the provisions relating to the reduction of subsidies, increased market access and rationalization of tariff and non-tariff barriers, immense opportunities exist for expanding the exports from a country like India, with its comparative advantages of diverse agro-climatic conditions and low cost skilled labour. To an extent these are negated by low productivity and poor quality of the products. These comparative advantages have to be translated into competitive advantage by putting in place an appropriate policy framework for augmenting productivity levels and improving the quality of the produce.

In the emerging post-WTO world economic order, one thing is certain that the direct competition from imported products can't be prevented. While one can argue on the merits and demerits of exposure of the Indian Fisheries Sector to foreign invasion, the relevant question is whether we can really stop the imported fish products from getting into the Indian markets? The answer is a clear 'no'. With the eventual dismantling of the quantitative restrictions and reductions of industrial tariffs our choice of warding off foreign competition is nothing more than wishful thinking. Fast growing countries all over the world have opened up their economies and integrated with world trade. They have learnt to compete in world markets and to open up their markets to import competition. Membership of WTO imposes certain obligations on all of us. At the same time it also provides us protection against unfair practices particularly from richer countries. In the absence of some international rules of the game, we would be even more at the mercy

of the rich. The value of being a member of the WTO is best seen in the far-reaching concessions.

So we must focus on how India can use the changed conditions to earn benefits. For this, first and foremost the economy has to identify and develop a modern infrastructure to facilitate the exports. The post harvest technology and the storage facilities need to be upgraded. There is a need to commercialise the fishing operations by improving the management and marketing techniques. This can be achieved by establishing mutually beneficial linkages with the industry. Thus there is plenty of scope for Indian to change from a mere producer to an exporter of value-added and processed fish and fishery products.

CHAPTER XXVII

ECONOMIC ASPECTS OF QUALITY CONTROL OF FISH & FISHERY PRODUCTS

Introduction

From the time that trading in fishery products commenced and monetary system were developed, it is likely that considerations of quality started to enter into commercial transactions. There would have been no point in developing a system of weights and measures to ensure fair quantity for money if fair quality was not given too. Cutting (1962) tracing the historical development of trade of fishery products, records that in Egyptian times fish to be eaten fresh had to be marketed daily and there was a requirement that pickling should be entrusted to qualified specialists.

In Grecian times many coastal cities owed their prosperity to trading in fishery products and each town had its own particular recipe, anticipating the development over two hundred different recipes for preparing and preserving fish, including the use of odoriferous herbal spices for imparting flavour (Schmidt, 1873).

What is quality- According to dictionaries &/ or glossaries – Totality of features and characteristics of a product or service that bear on its ability to satisfy a given need; degree or grade of excellence; grade of goodness.

Quality assurance - All those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality.

Quality control - The operational techniques and activities that are used to fulfill requirements for quality.

Reasons For Introducing Quality Control –

The following benefits to be derived from introducing a system of quality control can be outlined

- The health of the community is safeguarded.
- Possibility of contamination leads to greater care in handling of foodstuffs and residues likelihood of wastages of a community asset.
- Requirements for producers and merchants to give fair quality and to establish confidence in the trading system.
- From the viewpoint of producer and merchant, control of quality enables a reputation to be made for fair dealing, which assists in gaining price acceptance, consumers' confidence and increased volume of business.
- Ready demand allows rapid turnover and reduces storage costs and deterioration during storage of a highly perishable product.

Early recognition of the nature of the measures required for obtaining a high quality of fishery products included :

1. Care in the collection of raw material, use of appropriate nets and gears, observance of seasonal influence in order to take fish in best condition, proper handling onboard.
2. Proper gutting, dressing and cleaning of fish.
3. Use of good quality materials and correct quantities in processing, e.g.-salt.
4. Supervision of operations by overseers or inspectors.
5. Setting aside of processing areas and prescription for amenities required.
6. Time limits set for fish to be accepted for processing and to pass through various stages of manufacture.
7. Care to prevent damage in transport, e.g. due to overloading containers.
8. Correct grading and packing after processing.
9. Packing materials e.g. barrels, to be of good quality.
10. Correct labeling and branding of merchandise.
11. Inspection of imports at ports of handling.
12. Confiscation of substandard products; penalties imposed upon offenders.
13. Inspection in the markets.

Technological Versus Commercial Issues In Field Of Quality Control

There was lots of debate, confliction regarding the economic viability of fish processing industries to maintain the accepted quality of fishery products. A question also rose what would be basis of accepted quality standards for fish foods. However, from the time that scientists at Torry Research Station, Aberdeen and else where started to study the bacteriology, biochemistry and biophysics, of fish processing, a technological concept of fish quality evolved and was given expression in a new and rapidly proliferating field of scientific literature.

In this respect, the remark of scientist Laing (1965) at the conference on "Improvement of Quality" organized by the "White Fish Authority" is important —:

"The suggestion has seemed to creep in that quality is an end in itself, that no step to raise quality standards should be missed. This is not necessarily so. Quality is essentially a subjective evaluation of a product by its consumer. The only effective way that the scientists can bring it under control is by means of substituting for the subjective evaluation of customers' objective and, therefore, measurable attributes of the commodity. But we must never forget that these are no more than substitutes and that the real aim

is the satisfaction at any cost; he has most decided limits, beyond which he will not go, in paying for any given level of quality."

H.A.L. Morris (1969) has expressed a similar contention graphically in figure...

Which conveys that although the value that the consumer places on quality increases rapidly, in efficient practices, without excessive increase in cost of production aiming for a standard of quality beyond a certain level may produce situation. Where rapidly increasing production costs have little effect on the value attached to the products by the consumer. This is because a marginal improvement in an already good quality product may not be discernable by the consumer.

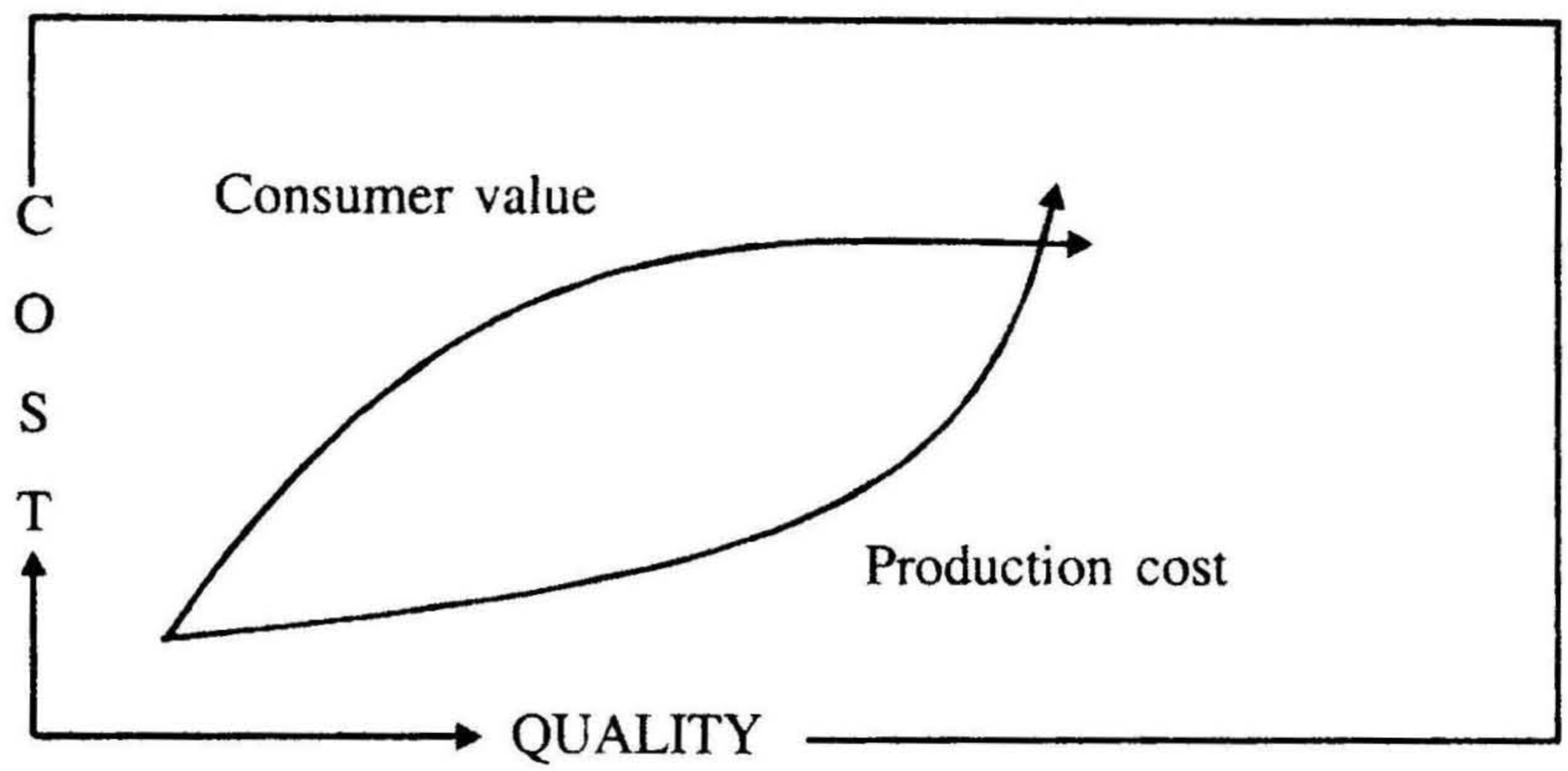


Fig – 27.1 Graphic representation of the relationship between quality and cost

Some management aspects of quality control

Every country should have national food quality control policies for the supply of safe, nutritious and honestly presented food, to protect consumer from contaminated decomposed or adulterated food. For this, some agencies should be required, which act under national food control services.

The policy implication, administrative framework and general matters are dealt with at length in "guidelines for developing an effective national food control system."

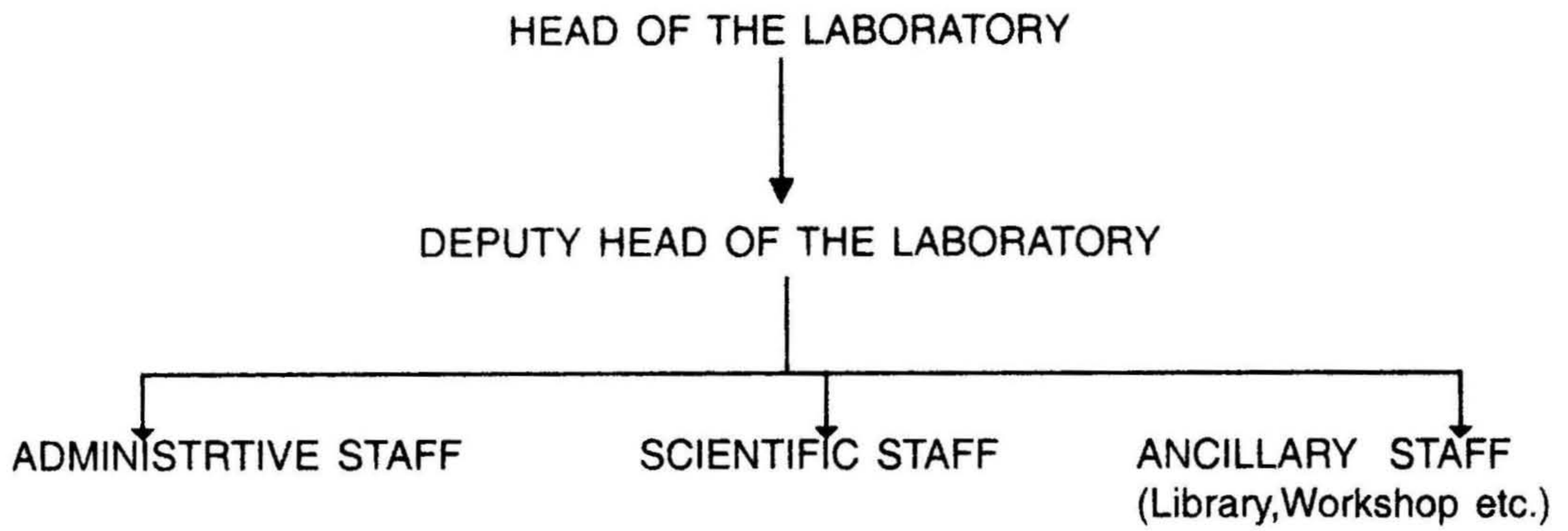
In many government structures there are staff and facilities located in different agencies that are involved in some or all aspects of food control, but their efforts are not highly effective due to lack of facilities, expertise or an adequate legal or administrative framework. These resources should be brought together into a unified structures in such a way that the personnel feel they are being together well utilized and are part of a team with clear objectives and facilities to carry them out.

Laboratory Facilities And Organisational Set-Up

A competent chemist or microbiologist, with extensive experience of food analysis, should head the laboratory involved in food quality control programme. The laboratory

must have facilities for analysis, benches frame-cupboard, chemicals, glassware's and apparatus.

The administrative set-up should be as following —-



In many small laboratories this can be adjusted by working of a same man in two responsibilities, such as head, also act as Deputy head of the laboratory.

Budget -

The need should be appreciated for as flexible a budgetary system as possible. Contingency funds are important for the running of a laboratory. Budget should be arranged so that funds are readily available for urgent supplies, spears and repairs and the other day-to-day needs of the laboratory which cannot wait for the usually slow cycle of fiscal machinery utilized for annual budgets in most government.

The laboratory head must have adequate control of the budget and operate it under clearly defined rules. These should be sufficiently flexible that he or she retains discretionary powers enabling transfer of funds between certain sub-heads as occasion demands.

Assessment and cost declaration of fish processing plant including its quality control activities

FIXED INSTALLATION AND COST -

FACTORY —	Site (tidiness, pollution)
	General design, layout, flow of goods
	Separation between clean/unclean processing areas
	Maintenance.
EQUIPMENT —	Sanitary installation and amenities (toilets, hand washing Facilities etc.)

Laboratory Facilities.

Water supply [quantity, quality (safe), hot, cold], chlorination boxes and containers

Machinery

Waste disposal

CHILLING AND/OR FREEZING CAPACITY — Ice supply

Chill room (according to number / size / capacity)

Freezers/ frozen storage (number / size / capacity)

Variable Factors And Cost —

RAW MATERIAL — (quality, handling and control wise)

PROCESS/ PROCESS CONTROL — Flow, marking

Temperature / temperature control

Work routines [(GMP / BMP), General tidiness]

Process control, delegation of responsibilities.

PERSONAL HYGIENE — Dress,

General requirements of hygiene maintenance (gloves, head cover, shoes)

CLEANING AND DISINFECTION — Organisation of disinfecting materials and chemicals

Cost of application

Control

QUALITY ASSURANCE — Principles, organization, and delegation of responsibilities

Staffs' requirements and their training

Monitoring of CCP's, records

Procedures and extra cost measure of out of control situation

Importance of consistency in quality

Whilst still some argument and a search for compromise between scientific and technological desire for perfection and industrial inclination to be satisfied with a quality

adequate for the consumer, it is agreed by both technologists and industrialists that what is vitally important in setting a standard of quality is the producers' capacity for consistently reaching it.

Growther (1968) has pointed out that whilst per capita consumption of poultry and meat in USA has increased substantially over a number of years, that of fish has remained substantially constant, he observed:" When a person is served, fresh well prepared fish or shellfish at home or in a, restaurant, he looks forward to his next seafood dinner. On the other hand, when the individual eats a poor quality fish product his memory of that experience stays with him a long time. Uncertainty of quality causes both the housewife and the restaurant patron to hesitate to try seafood".

Hamlisch and Taeylor also observed that a factor, which probably restricts demands in all areas where fresh fish is marketed, is the uncertainty in the housewife's mind regarding the quality of fish offered.

The following figure, describes the effect of variable quality in industry or household.

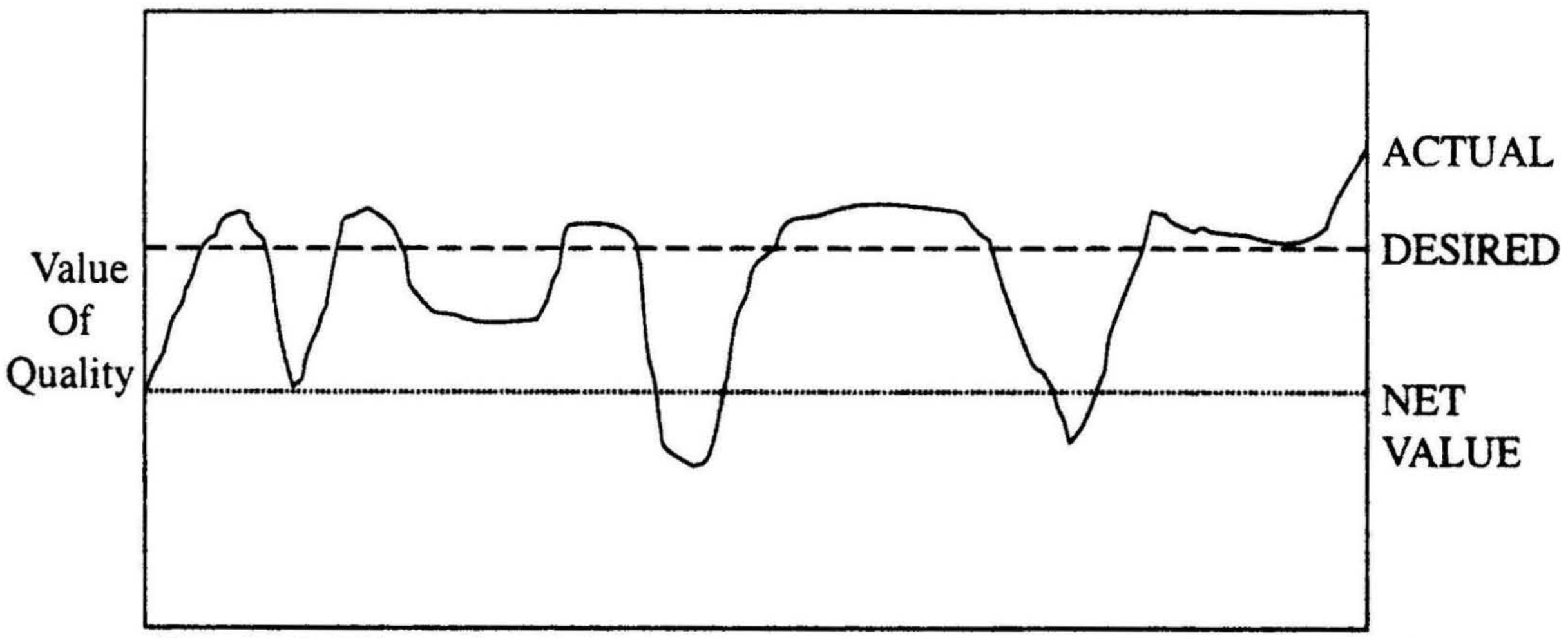


Fig. 27.2 Effect of variable quality (redrawn from H.A.L. Moris (1969)

In figure27.2, the desired quality to ensure consumer acceptance is represented by the broken line and where the quality attended fluctuates over the range shown by solid line, net value placed on the product by the consumer will lie close to that accordant at the lowest part of its quality range.

The achievement of the consistent quality should not involve increased cost, since; in general the variation is due to performance efficiencies where the same people with the same facilities produce irregular results.

National And International Quality Standards For Fish And Fish Products - Food standards have been introduced on a national / international basis to protect the consumers' health and to ènsure fare practices in food trade. There are mainly two categories of safety standards –

Safety standards - These are formulated to protect the consumer against food that are damaging to health.

Composition standards - These protect the consumer against fraud by ensuring food is unadulterated, pure and of good quality. Packaging should contain correct description labeling, weights etc.

The different standards in operation are - National Standards (ISI or BIS, BS, USFDA), International Standards (FAO Codex Alimentarius, ISO 9000 Series and HACCP) and Company Specific Standards

- **National standards**
  - **India** — Indian Standards Institution (ISI), which renamed as Bureau of Indian Standards (BIS) maintains their quality standards of exporting items. For seafood export, authority was Export Inspection Agencies, which was earlier Export Promotion Council (EPC). ISI was established in 1947 and it has now more than 50 standards for various fish and fishery products. MPEDA under Ministry Of Commerce is also regulatory and financing authority for quality control development.
  - United kingdom - British Standards (BS) —— Here the White Fish Authority and Herring Industry Board have published model, detailed minimum standards for a range of chilled and frozen products.
  - United States Of America —— Food And Drug Administration (FDA) engages in formation of processing standards, in the inspection of imported products and public health surveillance of processing establishment. There are three-grade system (A, B or Sub standards) for 15 or more major frozen products by the National Marine Fisheries Service (NMFS). FDA has also drawn guideline for Good Manufacturing Process (GMP). FDA regulates $ 1 trillion worth of products per year.
- **International standards**
  - **The Codex Alimentarius Commission (Codex Standards) (Joint FAO/ WHO)** Body - The aim of Codex is to develop food standards to be used world wide with a view to protect consumers' health and ensuring fair trade practices. Codex documents include provision in respect of good hygiene food additives, contaminants, labeling and presentation and method of analysis and sampling.
  - **International Standardisation Organisation (ISO) 9000 Series** - ISO was established in 1946 with headquarters in Geneva, Switzerland. The purpose of ISO is to promote the development of standardization and related world activities in order to facilitate the international exchange of goods and services

and to develop co-operation in intellectual, scientific, technological and economic activities. ISO with 14 founding members from Europe, the US and the British Commonwealth has grown to a worldwide federation with over 100 members. It has 180 active Technical Committees (TC) and over 620 active subcommittees, 30000 specialists engaged in developing international standards. ISO /TC-176 was established in 1979 to focus on standards in quality management and quality assurance and completed its tasks of development of ISO core series of standards in 1987.

ISO 9000 series were modeled after the British Standards (BS) 5750.

Table-27.1 ISO 9000 SERIES OF STANDARDS

ISO STANDARDS	TITLE
ISO 9000	Quality management and quality assurance standards; Guideline for selection and use.
ISO 9000-1	Guidelines for selection and use.
ISO 9000-2	Generic guidelines for the application of ISO 9001, ISO 9002 and ISO 9003.
ISO 9000-3	Guidelines for the application of ISO 9001 to the development, supply and maintenance of software.
ISO 9000-4	Guide to dependability programme management.
ISO 9001	Quality systems – model for quality assurance in design / development, production, installation and servicing.
ISO 9002	Quality systems – model for quality assurance in production and installation.
ISO 9003	Quality systems – model for quality assurance in final inspection and test.
ISO 9004	Quality management and system elements – Guidelines.
ISO 9004-1	Guidelines
ISO 9004-2	Guidelines for services
ISO 9004-3	Guidelines for processed materials.
ISO 9004-4	Guidelines for quality improvement.
ISO 9004-5	Guidelines for quality plans.
ISO 9004-6	Guidelines for project management.
ISO 9004-7	Guidelines for configuration management.

The standards are of two types:

❑ **Table-27.1.1** **Conformation :-**

ISO9001	It includes all elements in the promotion cycle from designing to servicing and contains 20 requirements – Design Product.
ISO9002	Same as ISO 9001, except that there are no requirements for design control. (Manufacturing only).
ISO9003	For final Inspection and test (neither design nor manufacture.

❑ **Table-27.1.2** **Guidance**

ISO9000	It is guidance standard for selecting the proper conformation standards.
ISO9004	It gives details regarding quality management and quality system elements.

· Table-27.2 Worldwide Equivalents of ISO 9000 Standards:

Country	ISO 9000Standard Nomenclature
Australia	AS 9000
Belgium	NBM-EN 29000
Brazil	NB- 9000
Canada	Z 299
China	GB / T 10300
Germany	DIN ISO 9000
India	IS 14000
Japan	JIS Z 9900
Switzerland	SN-EN 29000
United Kingdom	BS 5750
United States	Q 9000 *
EEC	EN-29000

* Assembled by American National Standard Institute (ANSI) for quality control (ASQC) as ANSI / ASQC Q9000 series.

Hazard Analysis And Critical Control Point -

World over the food processing industries are towards HACCP System of quality management. It was proposed by USFDA, which has been taken as a standard process control system for assuring food safety by international bodies. The FAO's Codex Allimentarius Commission has formulated guidelines for implementation of HACCP system in food industry.

In 1973, USFDA adopted HACCP for inspection of low acid canned food processing plants to prevent *Clostridium botulinum* contamination. In. In 1975 it was adopted for inspection of meat processing plant. In 1980 WHO / ICMSF (International Commission For Microbiological Specification For Foods) recommended for food safety in developing countries. European Commission (EC) made HACCP based quality management systems mandatory in fisheries and export of shrimp / fish products to European market. Such systems are recommended by USFDA for countries exporting seafood to USA.

HACCP Concept and its seven principles are as follows -

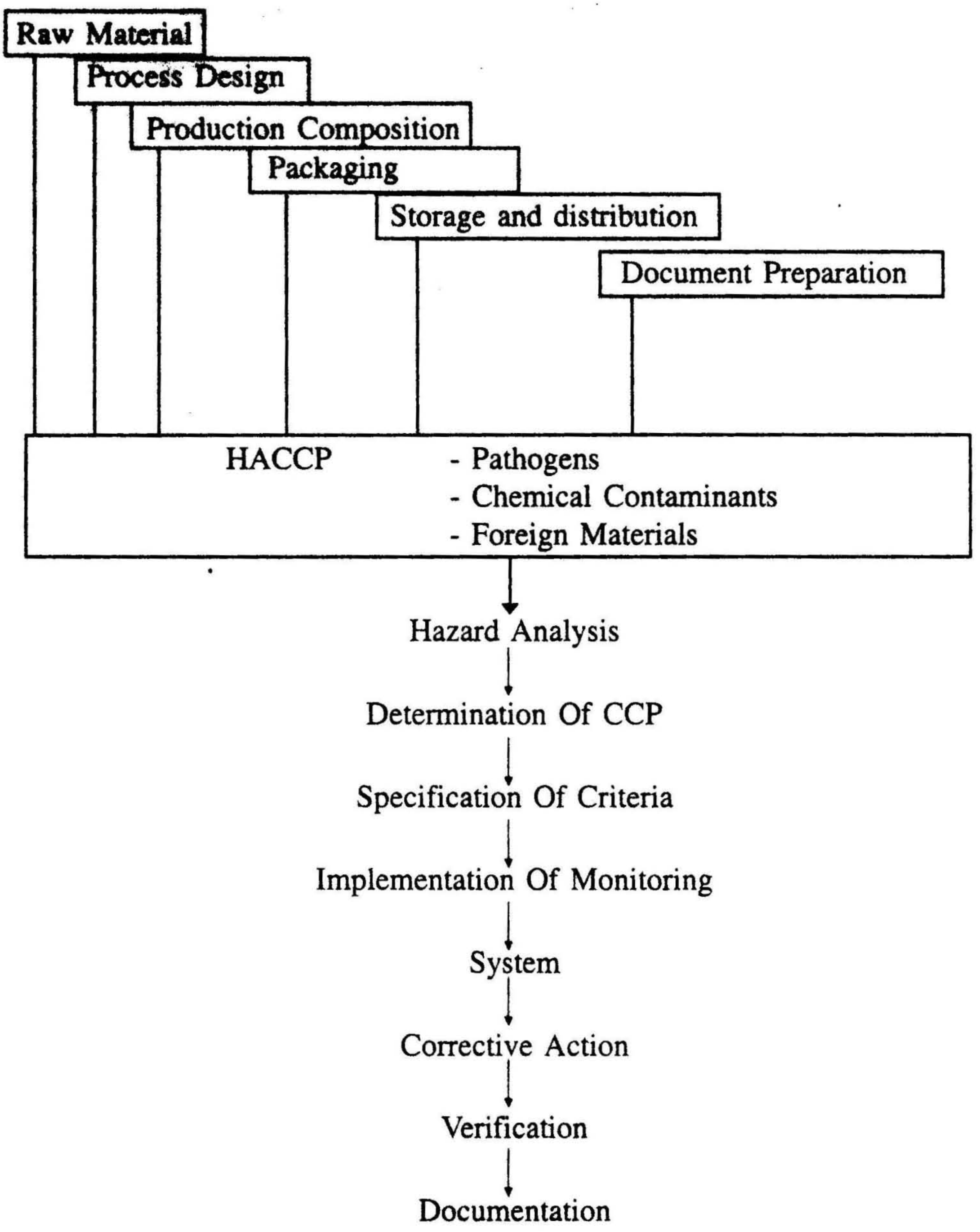


Fig.-27.3 HACCP and its seven principles

Sub Procedures Under HACCP - Standard Operating Procedures (SOP), Sanitation Standard Operating (SSOP), Defect Action Point (DAP) etc.

All time record for financial assistance for processing plant upgradation—

The development and quality control division of MPEDA operates a number of financial assistance schemes for the benefit of seafood industry. During the year 2000-2001 an amount Rs. 7.55 crores was disbursed towards assistance for the up gradation seafood processing units in the country. Some of the financial help schemes are given below.

1. Captive subsidy assistance for setting-up mini laboratories attached to seafood processing plants.
2. Subsidy assistance to seafood processors to establish preprocessing plant and to renovate existing pre-processing plants.

Subsidy schemes of the development section of MPEDA during the for modernization of seafood processing units to achieve EU /GOI standards —

a. Subsidy for automatic flake chip tube ice making machine.
b. Subsidy for generator sets.
c. Subsidy for upgrading deficient cold storage.
d. Subsidy for acquisition of all processing machineries and equipment for production of value added marine products.
e. Subsidized distribution of insulated fish boxes.
f. Interest subsidy assistance for seafood units to facilitate up gradation.
g. Assistance for establishment of chill room facility in seafood processing plant.
h. Assistance for installation of water purification system in processing plant.
i. Assistance for setting up of water effluent treatment plant in seafood processing plants.
j. Financial support for acquisition of refrigerated truck / containers.

The Out Line Of Assistance To Marine Product Sector Under Schemes Of 9th Plan - (1997-2001) -

1. Scheme for infrastructural facilities for preservation and processing of fish.
2. Scheme for determination of low cost preservation technology.

3. Scheme for person power development in food processing industries.
4. Scheme for strengthening of traditional fish processing technologies and marketing.
5. Scheme for generic advertisement on processed foods and marketing activities.
6. Scheme for promotion of food processing industries.
7. Scheme for participation in national / international exhibitions / fairs.

It can be observed, that in 9th plan there will be no particular scheme for quality control and quality assurance up gradation of seafood processing industries.

Table-27.3 MPEDA's Assistance For Modernization Of Seafood Industry

i. Setting Up Of Mini Laboratories In Processing Unit

Year	Number units assisted	Total amount of assistance (in Rs. Lakhs)
1997-98	17	8.14
1998-99	9	4.25

ii. Assistance To Establish Capture Peeling Sheds With Upgraded Facilities As Per EEC /HACCP Regulation

Year	Number units assisted	Total amount of assistance (in Rs. Lakhs)
1997-98	7	73.45
1998-99	3	33.58

iii. Technical Assistance by MPEDA for HACCP Implementation

Year	Number of training programme conducted	Number of persons trained
1997-98	6	170

Now MPEDA has undergone process for providing financial systems to the seafood processors/exporters for adoption of bar coding such as providing helps in registration etc.

Conclusion

So from the point of quality control in the fish processing sector we surely conclude that although as an entrepreneurs or processors we have to think about economic liabilities for paying attention to consumers preference with following the proper methodology of quality control and quality assurance. We can never compromise with food safety and consumers' health. So the quality front of the food processing has to be stronger than any

other work. At the same time to get handsome profit we should also notice to the economic viability of the processing sector. For reduction of cost of quality control field new and advanced technology needed which ensure full product safety as well as keep watching on pocket. This will be further needed joint effort from all workers of plants and also the consumers. So start shouting for " best quality seafood's" at your home now!!

CHAPTER XXVIII

THE CHANGING ROLE OF FISHERIES IN DEVELOPMENT POLICY

Introduction

India is a country with immense fishing and culture potential. The unscientific practices carried out in this sector led it to a chaos condition from which it's high time for it to get rid off. Management of the sector in an efficient way will help its revival form the prevailing situation. Policies are steps taken with a futuristic outlook. It's a relatively new term in the fishery sector. Policies taken in the past in European nations in the sector is well organized and adoption of such models may help to cult a new fishery policy for India

Need for policies in fisheries

1. Fish is a depleting resource though earlier in 19th century it was thought as an inexhaustible resource
2. Fishing in territorial waters of other countries often led to conflicts (often referred as 'conflict waters')
3. Needed to conserve and preserve the fast depleting stocks and genomic diversity.

Needed to preserve the rights of traditional fishermen.

Fish and fisheries – both marine and inland – are an intrinsic part of the livelihoods of many in developing countries. Recent work indicates the important contribution to food security made by fish caught as a part-time occupation of essentially agricultural households. The interface between the resource and people's livelihoods – especially those of the landless development – has so far been largely disregarded in the policies of governments and donors, which tend to be dominated by high seas fishing interests and other aspects of sectoral policy. Considerations of this kind suggest that a review of the orientation of fisheries policies would be opportune.

Policy conclusions

- Artisanal coastal and inland fisheries have so far been relatively neglected in policy. The introduction of a livelihood perspective suggests innovative ways in which policies towards them might be formulated.
- More closely integrated approaches to fisheries, agriculture, water and other sectors need to be adopted in development policy and planning.
- To assure sustainable resource management and future food security, the Food and Agriculture Organization's Code of Conduct for Responsible Fishing should be adopted and promoted.

- The capacity for sustainable fisheries management needs to be increased and developed at all levels – regional, national and community.
- The capacity for access to information that is relevant and in the appropriate format needs to be increased at regional, national, and in particular, at community levels.

Background

Increasingly, so that now these countries take more of the world catch than the developed nations. By contrast, over the same period, there has been a sustained increase in aquaculture. Most recent records show During the 1950s and 1960s there was a five-fold increase in world fisheries as technology improved. From the 1970s, however, productions from capture fisheries, as recorded by the Food and Agriculture Organization (FAO) has remained more or less on a plateau of 80–90 million mt. In marine fisheries, there has been something of a shift among the major players. In recent years, developing or emerging countries have been taking an increasing proportion of the catch, with China and India featuring global aquaculture production to have increased to 28 million mt annually. By far the greatest contribution to this is from China, South Asia and South East Asia, parts of which have an aquaculture tradition going back for more than a millennium but where modern concepts and developments have been met with a ready acceptance. By contrast, production from Africa and South America remains minimal despite, in the former case, the provision of much technical and financial assistance.

Marine capture fisheries can be broadly divided into two categories:

- Coastal or inshore fisheries – most often artisanal in nature.
- Offshore fisheries – which are largely commercial; requiring mechanised ocean-going fleet for their exploitation.

The offshore marine stocks can be fished by vessels of the coastal state or, through fishing agreements, by distant water fleets (DWF) of a developed country. Regardless of whether a developing country decides to sell its assets or develop its own fishing capacity, the position of the artisanal fishery must be safeguarded because of the economic, nutritional and employment benefits to the coastal artisanal communities. At present it is estimated that some 44% of marine fish stocks are maximally exploited and 16% are over exploited. It is unlikely that major increases in marine catches will be possible in the future, and that the most practical objective will be to maintain the present level. Demographic trends indicate increasing pressure on the resource as more individuals seek livelihoods from fisheries and as global demand rises.

Inland waters also have significant capture fisheries. They are often difficult to record, owing to their relatively diffuse nature, but they currently produce at least 10 million mt each year. With regard to rural development, generally inland fisheries can have the most impact. In floodplains, for instance, many – including women and children

– engage in casual fishing which makes a significant addition to the high-grade animal protein available to a household. The extensiveness of river systems also reduces the distance over which fish need to be transported. For example, fish from coastal areas are transported relatively long distances, with the risk of loss and spoilage before they can make a nutritional impact on the hinterland regions. Dams and reservoirs may fulfill a similar role, particularly when constructed in areas commonly short of other water bodies.

Both marine and inland artisanal fisheries tend to include the poorest sectors. It is often one of the few livelihoods open to the landless and often becomes the default livelihood. For this reason, as the human population increases and land becomes at a premium, there will be increasing pressure for people to adopt fishing as a livelihood. Aquaculture offers some response to this pressure but is far from a panacea. The commoner types of aquaculture require ownership or access to ponds and water, which often mitigates again the poorest. It is probably not an accident that the most successful country for aquaculture is China where land was nationalized.

Sectoral conflicts

Marine Fisheries

Within the marine fisheries the major potential conflict is between the artisanal fishery, which is coastal and inshore, and the commercial mechanised fleets exploiting the offshore resources. This conflict may be further complicated when the developing country decides that it does not have the resources to build its own commercial fleet but that it should sell the rights to a DWF of another nation, often of an industrial nation. Such decisions should be based on detailed knowledge of the sustainable quantities of fish to be taken since this defines the economic scope for development, but this is often not reliably known. Many countries take the easy option and enter into fishing agreements with DWF of developed countries either on a country-to-country basis or on a company-to-company basis or, in the case of the EU, on a supra-national basis. Conflicts with artisanal fisheries may be directly for fish but may also include the price-depressing impact of fish landed locally by commercial boats.

There is some evidence that more fish are being landed in developing countries now than previously. Over the last decade, for example, DWFs have accounted for around half the yield taken in the productive fisheries off West Africa (Brandt, 1999).

The conflict is most marked within those countries or bodies, which are significant donors whilst also having major DWF fishing interests such as Japan and the EU. The EU both negotiates fishing agreements with developing countries on behalf of the member states, whilst also having a policy of assistance to coastal states for fishery development. These responsibilities are split between two directorates until recently DG14 and DG8 (now DG Fish and DG Development).

A further complicating factor is the existence of subsidies for many DWFs. Cautious estimates suggest that these amounts to 17–25% of fishing revenues in industrialized

countries but are much lower in developing countries (Milazzo, 1998). The over-capacity generated by subsidies puts further pressure on the stocks. In any event, adequate information is rarely available to allow sustainable levels of off-take to be determined. Information is a key factor for the sustainability of fisheries stocks.

Inland Fisheries

By contrast with marine fisheries, the major potential conflicts with inland fisheries come from other sectors. Agricultural expansion is leading to a progressive modification of floodplains. More than 40% of the floodplains of Bangladesh, which themselves cover more than 69% of country, have been modified for rice growing. The use of water resources from rivers and lakes is increasing. More than 60% of the water flow of the Ganges River is abstracted for irrigation and other purposes and whilst some is returned, the quality has suffered. Agriculture is also increasingly using agro-chemicals, which get into the water bodies where they may affect the growth and mortality of fish or accumulate in their bodies to be passed on to consumers.

Pollution in the wider sense, from industrial and domestic sources, also presents conflicts for inland fisheries. There exists, therefore, a great need for policies on inland fisheries to be closely integrated with those of agriculture, water resources and also power, where hydroelectric structures are a significant feature. Any degenerative practices in a catchments area will have a potential impact on aquatic habitats, most of all on fish and fisheries.

Aquaculture

Here, conflicts with agriculture are similar to those with inland fisheries in some ways. Competition with agriculture for land and water, and water quality are critical factors. In addition, there may be competition with agriculture for inputs such as fertiliser or supplementary feed. In fact, livelihood needs for aquaculture are far more similar to those for agriculture than to fishing itself. Indeed, farmers tend to make better fish farmers than people who primarily fish for a living. Aquaculture may have downstream impacts on other sectors where intensive culture may generate polluted effluent. When aquaculture generates high returns (for instance, in shrimp culture in South Asia), this may cause land to be lost to shrimp culture at the expense of rice production.

Policy positions

The first thing to be clear about is that there is a distinction between policies for fisheries in development and fisheries policies as such, certainly from the point of view of donors and fishing nations. The latter will always possess an element of self-interest. The World Bank, which withdrew support to the fisheries sector after a fairly fraught history, but maintains a strand of fisheries interest within the Rural Development Department, provides the clearest example of policies. Most countries do not make clear their position on fish as such, but lump it in with general development policy. An exception is Denmark, which does have a stated policy (DANIDA, 1993). With regard to DFID, the

most recent formulation of development policy in the White Paper of November 1997 makes little direct reference to fish or fisheries but the implications of its principles for fisheries can be drawn out easily enough.

Implications of current UK development policy for fisheries and aquaculture resources

Political aspects

- Relates directly or indirectly to the 1997 White Paper. The Sustainable Agriculture Strategy also includes fisheries.
- Fisheries and aquatic resources administered through the Rural Livelihoods Department at DFID.
- Strengthen coordination between EU member states in fisheries Institutions.
- Supports the UN system and the FAO's Code of Conduct.
- Co-funding with multilateral to improve 'quality' of deliverables. Community management of common resources to be promoted. Integrated water management for catchments and basins, and inland fisheries and aquaculture to be promoted.

Economic

- Promote economic growth with environmental protection through income-generating activities targeted on the poor throughout economic exclusion zones (EEZs) and catchment areas.
- Support for private sector and optimum exploitation of resources.

Human resources

- Partnerships to transfer skills and knowledge at all levels. Invest in research through the Renewable Natural Resources Knowledge Strategy, including four fish programmes, and land-water interface of systems programme.
- Sustainable resource management
- Promote community management for future sustainability. Ethical trend includes certification of sustainably managed fish stocks

The European union

A clear expression of EU principles in respect of fisheries is to be found in the Lom é Convention. Titre III of Lom é is entitled Development of Fisheries and it contains eleven articles. Six of these articles define the objectives and mechanisms of the EU towards fisheries development and assistance with regard to ACP states, whilst the remaining five articles relate to agreements between the EU and the ACP countries by

which member states gain access to waters of the ACP countries. It is this division, which can create conflict and consequently lead to coherence issues within EU policy. The conflict and coherence difficulties are further compounded by the fact that the 'compensation' payments, made by the EU as part of the agreement, is deemed to pay for the monitoring, assessment and overall management of the fishery by the local state, thereby absolving the negotiating body from any responsibility. This disregards the capacity of the coastal state to conduct relatively expensive and sophisticated assessments and the right to hypothecate payment – in what is essentially a trade agreement – is questionable. As a result neither side knows how much fish is on the table, which jeopardizes the sustainable use of the stock.

As an example of the range of support that donors can give to fisheries in developing countries, it is worth examining Article 59 of Lom é. This states that the EU will help to:

- Improve knowledge of the fisheries environment and its resources
- Increase the means of protecting fishery resources and monitoring their rational exploitation
- Increase the involvement of the African, Caribbean and Pacific (ACP) states in the exploitation of deep-sea fishery resources within the EEZs
- Encourage the rational exploitation of the fishery resources of the ACP states and the resources of the high seas
- Increase the contribution of fisheries to industrial development by increasing catches, output, processing and exports
- Increase the contribution of fisheries, including aquaculture, non-industrial fishing and inland fisheries to rural development by giving importance to the role they play in strengthening food security, improving nutrition and the social and economic conditions of the communities concerned. This implies, inter alia, a recognition of and support for women's work at the post-harvest stage and in the marketing of fish

It is the last paragraph, which is the clearest commitment to the wider role of fisheries in rural development at the community level within a convention, which is otherwise dominated by issues of exploitation of marine fisheries. By contrast, the World Bank has withdrawn from engagement in anything other that the final paragraph. The EU, as a major fishing bloc, as well as a major donor, retains an interest in these elements. The fact remains that marine fisheries are only one aspect of the role that fisheries and aquaculture plays in the development process.

A further article of Lomé highlights the role of trade in fish products in relation to developing countries. Article 168 gives exemption to custom duties of fish products from

ACP countries providing they comply with EU standards. Some 60% of fish imports to the EU originate in ACP countries and have a value exceeding Euro 1 million per year (Brandt, 1999). It should be noted, however, that Lom é provisions do not uniformly apply beyond the ACP countries, and that the EC's wider rural development and fisheries policies are currently being re-formulated.

The EU estimates that accumulated waived import duties have exceeded Euro 100 million. This is clearly significant but probably does little to help the poorest people. There are exceptions, such as small-scale shrimp farmers in Bangladesh where the shrimp is solely for export, but benefits to poorer people are generally more likely to be in the form of employment in processing, i.e. adding value within the coastal state.

However, lack of tariff barriers clearly makes it more viable to export fish. As fish gains in value globalization of trade may suck more fish out of the developing countries into richer nations, thereby exacerbating food security issues in developing countries.

Food and Agriculture Organization

Strong commitment to sustainable resource management is expressed in the Code of Conduct for Responsible Fisheries drawn together by FAO following the Cancun Conference in 1992 (FAO, 1995) (see Box 2). The Code takes in all aspects of fisheries and is basically a code of best practice based on existing knowledge. It includes both general principles and guidelines for all aspects of fishery and aquaculture operation and development. Article five of the Code refers specifically to the Special Requirements of Developing Countries. It indicates the need to take into account the capacity of developing countries to implement the Code, especially the poorest and small island states. It emphasizes that their needs should be supported in areas of financial and technical assistance, technology transfer, training and scientific cooperation with respect to fisheries, to enhance their abilities to develop and promote their own fisheries.

Some key elements of FAO's Code of Conduct for Responsible Fisheries Political aspects

Code of Conduct for Responsible Fisheries, 1995. Non-mandatory but with obligatory elements of Law of the Sea, 1982 and Agreement to promote compliance with international conservation and management measures by fishing vessels on High Seas, 1993.

Committed to provide assistance for Code implementations

Institutional

- Help developing countries to follow the Code of Conduct.
- States, NGOs, international organizations to promote understanding and acceptance of the Code.

- Assistance for regional cooperation, decision-making and consultation.
- Control of flagged vessels and peaceful resolution of disputes to be promoted.

Economic

- Trade to be carried out in accordance with the World Trade Organization Agreement (has no application for fish trade at present but probably will in the future).
- Use aquaculture to promote income diversification.
- Multiple use of catchment areas and coastal zone to be ensured.

Human resources

- Decisions to be based on research and traditional knowledge. State promotes training for responsible fishing.
- Protect fisn workers' rights.
- Facilities and equipment to be safe for healthy, fair work.

Sustainable resource management

- Right to fish has obligation for responsibility.
- Precautionary principle is applied.
- Guidelines for protection of biodiversity.
- Guidelines for prevention of over-fishing.
- Responsibility for future of stock promoted.
- Conservation of species and habitats to be promoted.
- Pointers for fisheries in future development policies

From the poverty reduction viewpoint, the areas of greatest significance are coastal inshore fisheries, inland fisheries and aspects of aquaculture. Coastal and inland fisheries are mainly based on artisanal fishing with low capitalisation and mechanisation in what are essentially rural communities. Further, not all fishers are full-time, some are part-time or occasional. On the floodplains of Bangladesh only 20–30% of the total catch is taken by full-time fishers. Part-timers have other occupations, often seasonal, but fisheries remain an essential component of their livelihoods. This is a reason to recognize the interdependence of fisheries with agriculture or petty trading and, therefore, the need for a well-integrated cross-sectoral development policy.

Artisanal fisheries are mainly community-based and tend to be organizationally

weak and have poor access to information. They are also often in debt to moneylenders since they can offer little collateral, such as land, for formal credit. This may pressurize them into over-fishing and in an open-access situation, communities and interlopers scramble competitively for dwindling resources with damaging results on the stocks. Structured ownership or right of access by communities are crucial particularly where government institutions are weak. However, water bodies are often large and fish are very mobile so there is a limit to the extent a single community or administrative district can manage and control its own resources. There needs, therefore, to be an extensive network of linkages between participating communities to enable full management of the resources. Estimates of the impact of fishing on the stock are the most important piece of information communities need in conducting their own management. This is also typically absent from traditional management systems so far investigated. It is generally the case that it is at the institutional level of the community that information, in the appropriate format, is least available. In general, mechanisms for community management are less understood in fisheries than in other sectors such as forestry or wildlife.

The Code of Conduct has guidelines that are as applicable to artisanal communities as to high seas fisheries, and also highlights the institutional support required from donors. Help with information and the capacity to gather information is one of the features emphasized. In many ways the Code points the way for future actions and fills a gap that exists in many development policies. It also underlines the fact that access to a fishery gives a responsibility for its management, which underpins equally the basis of community management as it does for the role of distant water foreign fleets.

Finally, it is possible to summaries some of the key points to be taken into account for the proper inclusion of fisheries into development policy in the future as shown in below.

Some key points for consideration of the role of fisheries in development policies

- FAO's Code of Conduct for Responsible Fisheries should be adopted and promoted. Improved development of community/co-management systems in coastal/inland fisheries, with responsible ownership or access to resources, is required.
- Interdependence of fisheries, agriculture and water sectors should be recognized, leading to integrated policy and planning (e.g. basin or coastal zone management).
- Aquaculture may not be for the poorest but ways should be explored by which the poor can gain access to appropriate technologies (e.g. cages) as part of a livelihood diversification strategy rather than a production-led strategy.
- Stock enhancement (i.e. the artificial addition of young fish) and/or habitat restoration are the only realistic ways of increasing yields from capture fisheries – the need for cost-recovery links this to community management.

- Assistance needs to be provided for the development and implementation of sectoral plans and enabling legislation to developing countries for the planned, integrated use of resources and production of benefits for the poorest.
- The impact of globalization on fish availability in developing countries and the role of trade agreements need to be assessed.
- Employment generation in developing countries needs to be promoted through adding value to fish products by processing.
- The capacity for joint action in managing the resource needs to be enhanced.
- Credit and micro-credit schemes are needed that help to release the artisanal sector from dependency – increasing informal credit and traders.
- The capacity to collect key information needs to be increased and decision-making enhanced at all institutional levels.

Ultimately, the hand of developing countries in international negotiations needs to be strengthened. One way of doing this is by strengthening flows of relevant information. The management of fish stocks needs regular feedback of relevant information; otherwise rational decisions on stocks under pressure cannot be taken. Most donors, particularly bilateral, have access to considerable information collecting and analytical capacity and this is used to some extent. But the supply of information to each level is critical in assisting decision-makers. Regional management of fisheries must have an element of information sharing: this is another crucial issue given that waters extend over the boundaries of more than one country and many fish species are migratory. The support to regional bodies such as the Southern African Development Community or those of the riparian states of the African lakes is also a vital part of a consideration of fisheries in development policy.

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List of Acronyms :

ADB	Asian Development Bank
ADB	Asian Development Bank
AMS	Aggregate Measure of Support
AOA	Agreement on Agriculture
AR	Average revenue.
ATC	Average total cost.
AUSAID	Australian Agency of International Development
BFDA	Brackish water Fisheries Development Agency
BFFDA	Brackishwater Fish Farmers Development Agency
BIS	Bureau of Indian Standards
BOBP	Bay of Bengal Project
BOBP	Bay of Bengal Project
BOP	Balance of Payment
CIDA	Canadian International Development Agency
CIF	Cost, Insurance and Freight
CP	Consumers' price
CPI IW	Consumer price index for Industrial worker
CPI	Consumer price index
CPI-AL	Consumer price index for Agriculture worker
CRZ	Coastsl regulation zone.
CWI	Consignment Wise Inspection
DANIDA	Danish. International Development Agency
DAP	Defection action Point
DGFT	Directorate General of Foreign Trade
DICGC	Deposit Insurance and Credit Guarantee Corporation of India
DNA	Deoxyribonucleic acid.

DSFFP	Deep sea Fisheries policy.
DSP	Dispute settlement body
ECGC	Export Credit Guarantee Corporation
EEC	European Economic Commission
EEZ	Exclusive Economic Zone
EIA	Environment impact assessment
EIA	Export Inspection Agency
EIC	Export Inspection Council
EOU	Export Oriented Units
EPZ	Export Processing Zone
EXIM	Export and Import
FAO	Food and Agricultural Organisation
FFDA	Fish Farmer's Development Agency
FFDA	Fish Farmers Development Agency
FHP	Farm harvest price
FISHCOPFE	National Federation of Fisherman's Cooperatives
FOB	Free on board
FOR	Free on retail price
GATS	General agreement on trade in service
GATT	General aggrement Tarrif and Trade
GFP	Group based rural Finance Projects
GOI	Government of India
HACCP	Hazard Analysis Critical Control Point
HP	Horse power
HTL	High tide line
ICA	International Cooperative Alliance

ICICI	Industrial Credit and Investment cooperation of India
ICICI	Industrial Credit Investement Corporation of India
ICSID	International Centre for Settlement of Investment Disputes
IDA	International Development Bank
IDBI	Industrial development bank of India
IDBI	Industrial Development Bank of India
IFC	International Finance Corporation
IFCI	Industrial Finance Corporation of India
IPQC	In Process Quality Control
IQF	Individually Quick Frozen
LIC	Life Insurance Corporation
LP	Linear Programming
MC	Marginal coast.
MC	Marketing cost
MC	Marketing cost
MFN	Most Forward Nation
MIGA	Multilateral Guarantee Agency
MM	Marketing margin
MPEDA	Marine Product Export and Development Agency
MPEDA	Marine Product Export Development Authority
MPP	Marginal physical product
MR	Marginal revenue
MRS	Marginal rate of substitution
MSY	Maximum sustainable yield.
MVP	Marginal value product
NABARD	National Bank for Agriculture and Rural Development
NACA	Network of Aquaculture Centres in Asia Pacific

NAFTA	North American Free Trade Arrangement
NCDC	National Cooperative Development Corporation
NGO's	Non-Governmental Organisations
NORAD	Norwegian Agnecy for Development
NSSO	National Sample Survey Organization
OBM	Outboard motor
PCR	Polymeric chain reaction
PP	Producer's price
PP	Producer's price
QAMS	Quality Assurance And Monitoring System
QR	Quality restristictions
RBI	Reserve Bank of India
SAPTA	South Asian Preferential Trade Arrangement
SBI	State Bank of India
SC	Self-certification
SCICI	Shipping Credit and Investement Company of India
SCICI	Shipping Credit and Investment Company of India
SFC	State Finance Co operation
SFC	State Finance Corporation
SHG	Self Help Group
SPS	Sanitary and phytosanitary
SSOP	Sanitation standard operating
STC	State Trade Co-operation
TBT	Technical Barriers of Trade
TC	Total cost
TPAQ	Typical periods average quantity.
TR	Total Revenue

TRIMS	Agreement on trade related investment measures
TRIPS	Trade related, Intellectual property rights.
UNDP	United Nation Development Project
UNICEF	United Nation Children's Emergency Fund
UNIFEM	United Nation Development Fund for Women
USAID	United States Agency for International Development
UTI	Unit Trust of India
WCDC	Network of Aquaculture Centres in Asia Pacific
WPI	Wholesale price index
WSP	Wholesale price
WTO	World trade organization

SUBJECT INDEX